

How to Use the Targeted Cost of Green Products to Achieve Contemporary Industrial Requirements

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Abstract

The aim of the research is to identify the target cost technology and the mechanisms for applying green products in the manufacture of environmentally friendly products, in order to reach the provision of the necessary information that helps in reaching the green target cost, As well as providing a field study to the company, the research sample on how to use the target cost technology and apply it to green products in order to provide an environmentally friendly product that achieves a competitive advantage for the company at a reduced cost. In order to achieve the goal of the research, the State Company for Electrical and Electronic Industries was chosen as a sample for the research, due to the importance of the company, the diversity of its products, and the possibility of the company providing green products, The traditional electric water heater product was targeted in order to convert it into an environmentally friendly product through the use of a new technology for heating water, which is a nano carbon chips instead of an electric heater, The research reached a set of results, the most important of which was, the green target cost technology is the most appropriate technology for manufacturing green products because the process of determining the cost of the product takes place in the initial design stage of the product, and the conversion of the electric heater into an environmentally friendly heater has achieved time savings as the time spent to manufacture the heater The traditional (257.5) minutes, while the time spent to manufacture the environmentally friendly heater reached (170) minutes, thus achieving savings of (87.5) minutes, or 34%, The research came out with a set of recommendations, the most important of which was the necessity of directing modern cost-effective technology to serve the environment due to the global trend of caring for the environment due to environmental pollution and the decrease in natural resources, especially scarce ones, And also the need to form working teams of engineers and cost accountants in order to reach developments in the engineering side and in the cost side

Keywords: target cost / green products

Introduction

Economic units have become looking for ways and cost-effective methods that lead to reducing the costs of the green product, which has four main dimensions, namely reducing energy, reducing resource consumption, preventing pollution and using renewable energy while not compromising quality and satisfying customers in order to enhance the competitive advantage. Among these modern cost technologies that contribute to providing green and environmentally friendly products that achieve a competitive advantage is the green target cost technology, which is a strategic approach to cost management that begins with the product design stage and works to reduce costs Without sacrificing the functional characteristics desired by the customer or eliminating unnecessary functional characteristics of the product, which consumes resources, costs and time, and does not add value to the customer, and the customer is not ready to pay the corresponding price, provided that it does not affect the level of quality required in the product. In order to achieve the green target cost, it will require the use of the disassembled analysis technique, which is one of the effective techniques for determining the green target cost in the design stage of the green product to reduce the cost and improve the quality of the environmentally friendly product. The disassembled analysis of the products of the competing economic units is used to identify the designs and specifications of their products, the raw materials and the technology used in the design and manufacture of the green product by using the comparison between the design of the product of the economic unit with the designs of the competing economic units in order to try to improve the product or reduce its cost and to search for ways to make it a friend For the environment.

The first topic: Research methodology

First: the research problem

Measuring the environmental impact and costs of remediation efforts is challenging because they do not appear as part of traditional cost accounting models under traditional applications, according to which the costs associated with the environmental dimension are not explicitly identified. Understanding these costs and identifying them contributes to the process of reducing costs and developing the product effectively and efficiently. Therefore, the research problem is that there is an inevitable need to use modern cost-effective methods and methods that work to provide an environmentally friendly green product that competes with the foreign product in terms of quality and price, thus achieving customer satisfaction and achieving a competitive advantage. This is because the traditional Calvinist systems have become unable to face the contemporary wave of challenges.

Second: The importance of research

The importance of the research comes as it dealt with an important topic represented by green products and their mechanisms through the application of targeted cost technology in order to achieve contemporary industrial requirements, especially since Iraq has become one of the lagging countries in the field of environmentally friendly products (green) and it suffers from environmental problems. In addition to the researcher's endeavor to apply these modern cost-effective technologies to one of the products of one of the Iraqi industrial and economic units and to present the results to the company's management to benefit from them in determining the target cost and work to reduce costs in the design stage as the best stage to reduce costs because the costs at this stage are planned costs (Ineffective), providing the necessary information to make decisions related to product design, characteristics, prices, and determining the target profit margin.

Third: The aim of the research

The research aims to identify the target cost technology and the mechanisms for applying green logistics in the manufacture of environmentally friendly products, in order to provide the necessary information that helps in reaching the green target cost, as well as presenting a field study to the company. The research sample is how to use the target cost technology and apply it to Green products in order to provide an environmentally friendly product that achieves a competitive advantage for the company at a reduced cost.

Fourth: the research hypothesis

The research seeks to prove a main hypothesis that "using targeted cost technology on green products in the manufacture of products would reduce costs, which in turn would be reflected in enhancing the competitive advantage of the company.,

Fifth: the research community and sample

The research community is represented by the Iraqi public industrial companies, since these companies are considered among the main companies in the field of manufacturing in Iraq and are among the companies with large production and funding from the state, As for the research sample, it was represented by the General Company for Electrical and Electronic Industries, due to the importance of the company, the diversity of its products, and the possibility of the company providing green products.

The second topic: a conceptual introduction to the target cost and green products

Continuous development procedures for products and production processes are necessary to meet the desires of customers and maintain

them by producing new products that compete with market products, The nineties of the last century showed the interest of most companies' management in cost management techniques applied by Japanese industrial companies, in particular the effect of product design on manufacturing costs because Japanese companies gained competitive advantages that positively affected their position in the market through Following the target cost technique, which is a technique that focuses on searching for production alternatives with the aim of reducing costs during the production planning stage.

In light of the increasing intensity of competition in the modern day business environment, the price has become directed by market forces and not the cost, so that competitors offer their products that meet customers' desires in terms of international quality and reduced price, Therefore, companies operating under intense competition seek to target the competitive prices offered in the market if they want to remain in the market, Where the companies that are not in line with the modern competition environment and in which the prices are directed by the market and are committed to pricing their products according to the basis of cost plus a profit margin are described as an ostrich that puts its head in the sand and does other things, Therefore, the cost has shifted from an inevitable result to a fundamental constraint that should be accomplished by reducing the cost of products without compromising the quality of the product to a certain level called the target cost. (Atkinson, et.al, 2012: 305)

It was defined (Atkinson & Kaplan, 2012: 124) as a cost management tool used during the planning and design phase to direct efforts aimed at reducing future costs of manufacturing a product.

While Blocher defined it as the process of determining the desired cost of a product on the basis of competitive price, with the aim of achieving the desired profit from that product. (Blocher, 2016: 253)

It has been defined as a method for determining the cost of a product or service on the basis of the price (target price), which is the price that customers are willing to pay, and the price and characteristics required for the product are determined, and the job of the company's engineers is to design and develop the product at that cost and the target profit that is covered by this. Price (Hansen .et.al, 2017: 598).

According to the aforementioned, it is possible to define the target cost technique as an important pre-production cost management technique that aims to accurately measure the cost at the product design stage and within certain cost limits so that the unit can study its activities to reduce its actual costs to match the target costs. The target cost is calculated based on the average prices of the competing commodities minus the target profit.

Second: Steps to implement the target cost

The process of applying the targeted costing technique goes through the following steps:

The first step is to determine the target price:

The price is defined as the estimated price of the product that the customers are willing to pay, and this estimate is based on the basis of understanding the value that the customer perceives for the product and the prices of competitors, or it is the competitive price that companies seek to reach in order to stay in the market. The goal of the target price is to define and achieve the level of technical performance for each feature of the product specification that contributes to maximizing the difference between the customer perceived value and the cost of the product (David & David, 2017: 147)

The second step is to calculate the target cost:

The target cost is calculated by subtracting the target profit from the target selling price. Usually, profitability and return on investment ratios are relied upon in determining the target profit because it examines the company's ability to generate profits from sales, assets and property rights. Profits are a measure of the efficiency and effectiveness of the company's management in investing, operating and making decisions. The target profit is usually determined as a percentage of the target selling price for each unit produced or sold ($\text{target profit} \div \text{target selling price}$).

The third step: calculate the target discount

The current costs represent all the costs of the operations necessary to produce and deliver the product, and these costs are often greater than the target cost due to market forces pressures that require the company to reduce the costs of its products. The difference between the target cost and the current cost is called the target cost reduction. Therefore, competitive pressures make the target cost a general goal that should be reached through the use of all tools and methods. (Bragg, 2010: 69)

The fourth step: reach your target cost

The target cost is reached in the following ways:

Method one: Value Engineering

Method two: Teardown Analysis

Third: the concept of the green product

Despite the recent trend towards innovation of green products, as this trend has become prevalent among economic units, there is still a lot of confusion about what green or sustainable products represent and the following different perspectives for defining green products:

Some believe that any product whose impact on the environment is zero is called in the business field the term green product or environmental

product (GP), but this term is also used for products that seek to protect, enhance and preserve the environment through energy conservation Or resources and the reduction or elimination of toxic substances, pollution and waste, and this definition of a green product shows the extent of the difference in the types of green products that focus on environmental issues such as energy, resources, pollution and toxic waste. (2013: 273, Aktas).

Others argue that a green product is that product designed to reduce environmental impacts during its entire life cycle by using renewable resources and avoiding the use of non-renewable resources, avoiding the use of toxic substances, and avoiding the use of non-recyclable materials (Durif et., Al, 2010: 27)

It was also defined as any product designed and manufactured according to a set of standards that aim to protect the environment from any damage and reduce the depletion of natural resources while preserving the basic functions of the product, that is, those characteristics that meet the customers' desires without harming the environment or are beneficial to the environment, The green product is the product that is characterized by several characteristics, including (non-use of preservatives, minimal energy consumption, preservation of raw materials and minimal consumption of them, and no toxic materials used in the product) (Abdul Razzaq, 2009: 283).

The term green product refers to products that will not pollute the land or cause depletion of natural resources by combining environmental strategies with the production process through the use of Recyclable materials and the use of less toxic materials to reduce environmental impacts (Chen, 2010: 29.)

From the above concepts, we find that it is possible to define the green product several dimensions upon which it is based, namely (limiting the use and preservation of natural resources, avoiding the use of toxic substances harmful to the environment, working to reduce pollution rates, and using renewable energy).

In addition, we conclude that the economic units that offer green products must take care not to compromise the quality of the product and its basic functions, and work to satisfy customers and meet their desires.

Fourth: Using the target cost in manufacturing green products

The use of the target cost in the manufacture of green products as a technique based on the idea of integrating the costs of environmental requirements with the target cost, for example when determining the target price, including setting a green price premium, and using the green Kaizen method, This will be reflected in the various six principles of target costing which are (focus on the customer, focus on design, work teams, direct the product life cycle, and engage the value chain). The term

green target cost is based on six steps to develop the traditional form of target costing, which are: (26- 2012: 27, Horvath & Berlin)

- 1- Defining and evaluating green specifications and jobs
- 2- Evaluating the target selling price and the green price premium
- 3- Adjusting the green profit margin
- 4- Distribution of costs to cost drivers
- 5- Implement cost management measures
- Implementation of green Kaizen costs6-

The green target cost is defined as the process of integrating the target cost action mechanisms and applying them in the development of the environmental sustainability strategy. The target cost strategy enhances the strength of practices and leads to a more comprehensive approach. It can be a useful tool to help determine the permissible cost of the product because customers are often unwilling to incur additional purchase costs for the products despite the fact that environmental programs refer to the importance of green products (Hendricks, 2015,11).

Some argue that the green target cost is the process of incorporating environmental issues into the traditional target cost model due to regulations and legislative issues

Green consumerism, stakeholder demand. In many cases, we notice that these issues are the ones that present themselves in most cases specific to the nature of the products of the economic unit, for example in the automotive industry, cars must be designed in accordance with environmental standards imposed by the legislative authorities ((Malone, 2015: 6)

We see from the above that the process of developing the traditional target cost technology into a green target cost came in response to the increased desire of customers to obtain environmentally friendly products, taking into account the environmental standards imposed by the legislative authorities at a reasonable price for them. And the desire of economic units to remain in a competitive position in the market by providing green products at an affordable price to customers.

Fifth: Steps to apply the target cost to the green industrialization stages

The first step: identifying and evaluating the required green properties and jobs

In the first step, the features of the product (or service) in terms of quality and functionality should be defined from the customer's point of view. According to the characteristics of the product, the perceived value is checked by the customer for each characteristic. And when it comes to green products, Customers are usually not aware of environmental requirements. In addition, there are no standards and indicators in many industries, and the meaning of "green" or "environmentally friendly" is

often ambiguous. On the other hand, requirements for green products are guided by environmental laws. These requirements are often seen as inevitable, and their fulfillment has no effect on the perceived value of the product from the customer's point of view. On the other hand, economic units apply the characteristics and functions of green products on a push or pull basis, "Withdrawal" means implementation according to the customer's request, while "payment" means knowing the characteristics of the green product created by the economic unit itself. Both the payment and the withdrawal increase the perceived value by the customer. Whereas only withdrawing specifications can lead to perceived decrease in value by customers when they do not find these specifications. Chen, 2010: 85).

To derive target values for environmentally related product specifications, several approaches have been developed. Under the external approach, target values are derived from market information such as industry information and competitors' sustainability reports. The internal curriculum is closely related to environmental management activities and economic unity programs. In the best case, the target values can be derived directly from the environmental strategy of the economic unit. The unified curriculum links the internal and external. The evaluation of the perceived value by the customer for each characteristic of the product is arrived at by means of joint analysis. This standard tool can evaluate a specified number of product characteristics at the same time. Thus one or two environmentally related product specifications can be integrated in order to avoid the "green standard effect" on evaluation. It is possible to take into account the potential environmental interference in the various product specifications. An example of overlapping vehicle product specifications is a reduction Fuel consumption "and" low carbon emissions. "Thus cost allocation may be biased (2012-28: 27, Horvath & Berlin).

The second step: estimate the target selling price and the green price premium

The second step is to determine the target selling price by analyzing competitive market conditions and observing customer feedback. The preliminary results on the selling prices of green products are contradictory =. Several studies highlight the willingness of customers to pay a price premium for green products, Other studies indicate that the green price premium can be realized under certain conditions. The first factor that may explain customers' different desires is customers' confidence in the extent to which environmental benefits are achieved when purchasing the product. If the environmental issues are real environmental problems such as global warming, then high confidence and willingness to pay a price premium generally prevail. If the green

price premium is paid, it is used to achieve the environmental characteristics of the product. However, with the increasing spread of green products in all industries, it can be assumed that customers' willingness to pay the green price premium would ultimately decrease. Consequently, the selling prices of green products will be similar to the selling prices of traditional products (Daoud, 2017: 125).

The third step: Adjusting the green profit margin and calculating the allowable costs

This step is to calculate the allowable costs by deducting the target profit margin from the target price. The results of target profit margin from long-term profit analysis are often done on the basis of return on sales (net income divided by sales). Return on sales is the most widely used metric because its calculation is uncomplicated and can be linked to the profitability of each product.

Against the background of green product design, the target profit margin needs to be adjusted. Currently, environmental product design is related to higher market risk and higher design effort. In many industries green product experience is rare. On the other hand, green products are less likely to succeed than traditional products. On the other hand, product designers often need to build environmental knowledge and information systems into their initial design projects. While all costs incurred during the product life cycle should be covered by the selling price, only direct product costs are part of the target costs. Indirect costs such as administrative are dealt with as a single block and presented as relative cost targets (reduction) regardless of the perceived value by customers. Often the environmental costs related to the characteristics of the product are indirect costs. For example, the costs of clean production are indirect costs of the product. The allocation of environmental costs is according to the principle of cause-effect and units Economic need to create an environmental cost account. (Draghi, 2016: 35).

Step four: allocate costs to green cost drivers

When permissible costs are allocated to a product unit, designers work to define the allowable costs for each component of the product. Thus the customer realizes the value of product specification. Usually this is done via the QFD and within a matrix.

The allocation of perceived value by the customer to the components is based on the knowledge of the engineers. This is a very important point in the traditional target costing because the allocation is very subjective. In the context of environmental requirements it is more important as designers need to know the environmental impacts of each component.

This includes life-cycle analysis of all impacts as a proposed standard for a global warming convention. Product life cycle analysis is costly and time consuming and requires comprehensive environmental information

from suppliers and distributors. Thus it is important to integrate the value chain of all partners in the target costing process and bring in environmental experts from the environmental management department. (Ali, 2018: 64)

Fifth step: implement green target cost management metrics

It includes three steps: (Abdul Razzaq, 2009: 91)

1-Determine the standard costs of the products .

2-Comparison between standard costs and permissible costs for each component .

3-Analyzing deviations to improve component design and reduce the total cost without compromising functionality and quality.

The determination of standard costs for green products. Requires data on the environmental costs of products based on an assessment of environmental impacts at each stage of the life cycle. Other than that, environmental costs are indirect costs that can be managed in later steps. The comparison between standard costs and traditionally permitted costs is made via a value control chart. Each component value index indicates whether the component costs are too high or too low to provide perceived value to customers. To highlight the environmental requirements, a scheme should be added To monitor the environment. As mentioned in the first step, there are environmental issues such as reducing carbon emissions or improving energy efficiency, which are addressed during the environmental design of the product. Besides cost evaluation, physical values such as carbon emissions or energy efficiency are analyzed and this can be implemented for each component.

On the basis of the permissible environmental impacts and the standard environmental impacts, the environmental index is calculated for each component.

An environmental indicator indicates which components are plus or minuses with respect to a specific environmental issue. The permissible environmental impacts may be directed towards components that are able to reduce certain impacts, such as carbon emissions. The total emissions costs are then allocated to the target product based on the potential for each component to be reduced. The calculation of standard environmental impacts is based on feedstock and energy flow data. This requires actual data models that reveal deviations in actual values of new or modified product designs (Horvath & Berlin, 2012: 28).

The third topic: the applied side

First: The green product that the company seeks to produce and sell in the markets

The company is looking for a research sample to find ways to provide environmentally friendly products (characterized by low energy

consumption) at a reduced cost to compete with imported products in the local markets to meet the needs and desires of customers.

The company seeks to carry out a disassembled analysis of the traditional electric water heater product in order to convert it into an environmentally friendly product by using a new technology for heating water, which is carbon nanoscale chips instead of an electric heater. The mechanism of its operation depends on the passage of an electric current in it that generates thermal energy. This thermal energy is based on the induction of nanoscale carbon atoms that in turn release infrared radiation, which leads to heating the inner tank of the heater and thus heating the water, as the carbon chips are heated within a few minutes, and it is possible to use different types of heaters. In terms of heater capacity and with the same working principle.

The use of nanoscale carbon chips in water heaters is considered the safest system, so there is no possibility of combustion, taking into account the highest safety and security standards in manufacturing, as it is waterproof and completely insulated and protected from moisture and various weather factors and is not flammable or combustible. It does not require maintenance, its operational life is relatively long, and it is an environmentally friendly heating system. There is no emission of toxic gases, as well as the system's output of carbon chips is thermal energy that does not depend on a combustion mechanism to produce energy or convert it like other systems that depend on burning fossil fuels of all kinds. To produce thermal energy and the associated gases harmful to humans and the environment. Hence we see that the use of carbon chips contributes to the global mission of reducing emissions. Carbon dioxide and the carbon chips system used in heating is a silent system, and it does not have any negative effects on the surrounding environment, as it maintains the humidity because infrared rays are similar to sunlight in their effect.

Second: Determining the target selling price with the addition of the green price

This step is the first step for the green target cost technology that will start with the field survey that the researcher conducted in the Iraqi market and with multiple agents and in different regions of Iraq to search for a product (electric heater) Environmentally friendly and applies environmental specifications and standards desired by the customer. She did not find that product, so she resorted to the traditional products that compete in the market, which are shown in Table 1, to calculate the target price for the electric heater product. The research sample provided by the company as a first step with the aim of comparing this price with the current product price of the company, then adding a green price premium

to the target price, as the company seeks to add environmental characteristics to the traditional product.

Table (1)

Competitive (not environmentally friendly) commodity prices for the 80 liter electric heat

NO.	product name	Origin	Price
1	AL-Tahan	Iraq	80000
2	Heatex	Turkey	110000
3	AL-Hafidh	Chinese	110000
4	Emirates	Emirates	90000
5	AL-Hasawi	Kuwait	95000
6	Dubai	Emirates	85000
7	AL-Ameen	Iraq	75000
8	Al-Azzawi	Iraq	75000
	Total		720000

$$\frac{\text{Total prices of competing products}}{\text{The number of competing products}} = \text{target price}$$

Since the company seeks to provide a green electric heater (environmentally friendly) that achieves a competitive advantage By adding environmental characteristics to the product and in accordance with international environmental standards in accordance with ISO 9001 and ISO 14001 standards, this requires customers to pay a price premium called (green price premium) added to the target price of the traditional product that is used to achieve the environmental characteristics of the product, This will depend on customers' desires and awareness of the importance of the trend towards consuming green products and their confidence in achieving environmental benefits when purchasing the product, Since green products are considered products that are not generally widespread in the Iraqi environment, this will not enable the company to add a large price premium. The company seeks to enhance its position in the market by providing a product that is distinct from other products at a price close to the price of the traditional product and at a reduced price premium that does not significantly affect the customer, Accordingly, the company decided, according to the opinions of engineers and cost employees, to add (5000) dinars as a green price allowance, which is relatively symbolic, to avoid the risk of customers not coming to the product because of its high price compared to the traditional product, and therefore the green target price will be equal to (95000) dinars.

Third: Determine the green profit margin

After setting the green target price, the green profit margin should be determined as a second step for the green target cost steps, and the company in general has set a profit rate ranging between (5% -15%) But since the company aims to provide a green product (environmentally friendly) that works to reduce the consumption of electrical energy and thus reduce the cost of operation in the long term and with specifications not offered by the competing companies, that is, it is a product that is not widespread in the market and customers do not have information about it and its working mechanism, It will be exposed to high market risks, so an additional fee should be added to the profit margin, and 50% of the regular profit margin has been determined as an additional percentage to meet the risks of launching a new product this percentage was determined based on the opinions of specialists in the company from engineers, managers and technicians, and accordingly, the target profit margin will be calculated through the following equation:

Desired Green Profit Margin Ratio = (Normal Profit Margin x Extra Percent to Support Environmental Characteristics) + (Normal Profit Margin)

Desired green profit margin ratio = (10% x 50%) + (10%) = 15%

The company has set a low profit rate compared to the benefits that the customer will receive as a result of using this product to avoid raising the price of the product because it seeks to encourage customers to consume this type of product in an attempt to increase environmental awareness in Iraqi society And the importance of directing energy use due to the electric power crisis that the country suffers in an attempt to conserve resources. Accordingly, the target profit will be as follows:

Green Target Profit Margin = Green Target Price x Green Profit Margin ratio

Green profit margin = (95,000) x (15%) = 14250 dinars

Fourth: Determine the green target cost

In this step, the move will be made to the third step of the green target cost steps, as in this step the green target cost of the environmentally friendly electric heater that the company wishes to produce and put on the market is determined.

Green target cost = Green target price - Green target profit margin

= (95000) – (14250)

= 80750 dinar

After performing the functional analysis of the current electric heater and identifying the parts associated with each job, the actual cost of each job should be determined in order to calculate the ratio of the actual cost of each job to the total actual cost of all jobs and to calculate the total actual cost the actual material cost and the actual wages associated with each job

must be calculated. The table below (2) shows the type, quantity, and price of the raw materials needed for each job.

Table (2) Calculating the actual material cost for an 80 liter electric heater product

No.	Occupation	Material	Quantity (1)	Part Purchase Price (2)	Total cost (1) x (2) = (3)
1	Heating the water	Heater	1	17000	18130
		Galvanize d iron 0.7	1.13	1000	
2	Keep the water hot	Rock wool	5075	3500	1.45
3	Store water	Galvanize d iron 1.5	10.22	1410	18725
		Aluminum	1,225	2960	
		Welding material (welding)	0.708	974	
4	Connect the power supply	Triple cable	1.5	1767	2755
		Red lamp	1	105	
5	The entry and exit of the water	pipes	0.3	3000	2784
		Bush 3/4 inch	1	750	
		Bush 1 inch	1	1000	
		Teflon	2	67	
6	Aesthetic addition to the product	Blue paint	0.6	8333	5650
		Stabilizers	0.5	1300	
7	Packaging the internal contents of the heater	Galvanize d iron 0.7	8.45	1000	12221
		Aluminum	1.225	2960	
		Welding material (welding)	0.150	974	
8	Install the heater	Galvanize d iron 1.5	6.31	1410	8917
		Welding	0.021	974	

		material (welding)			
9	Metal cleaning	Nitric acid	1200	12000	0.1
The total actual material cost					75457

After determining the actual cost of each job by adding the cost of all parts associated with performing each job, the actual wages should be determined. For the purpose of determining the wages, the average wage of the worker must be calculated per minute according to the following table, which shows the departments involved in the manufacturing process, the number of workers in each department, as well as the total wages of workers.

Table (3)
Calculating the total wages of workers

No.	Section	Number of employees	Total wages of workers
1	Pistons	57	26464250
2	Welding and foundations (services)	79	41186000
3	The ladies	50	17660500
4	Plastic	16	7789500
5	Quality control	92	61927500
6	research and development	27	13852750
Total		168880500	321

$$\text{Avg wage for worker to manufacture heater} = \frac{\text{Total Wages}}{(\text{Total number of employees})}$$

$$= \frac{168880500321}{321}$$

$$526107 \text{ dinars per month} =$$

In the above equation, the average wage of the worker was calculated per month, but we need the worker's wage per minute for the purpose of calculating the actual wages for the production of the electric heater. The wages per minute will be calculated through the following equations:

$$\begin{aligned} \text{Minutes worked} &= \text{Number of days} \times \text{Number of hours worked} \times 60 \text{ minutes} \\ &= 30 \times 7 \times 60 \end{aligned}$$

$$= 12600 \text{ min per month}$$

**Average worker's wage per minute = average wage per worker ÷
Number of minutes worked per month**

$$12600 = 526107 \div$$

$$\text{dinars per minute pay} = 42$$

After that, the researcher studied the technological behavior of the electric heater product to use it in calculating the number of minutes that must be taken by the workers to complete each job of the product. The researcher was not satisfied with relying on the technological behavior, but went to the actual calculation through the (stop watch) and study movement and time by calculating the times needed to perform each job and in cooperation with the work team from engineers and technicians to calculate the total cost of wages by multiplying the number of minutes needed for each job by the wage of one minute. For example, the total wages for a water heating job amounted to 2562, which is multiplied by the number of minutes (61) in the wage of one minute (42). Table (4) shows the actual wages for each job Of jobs.

Table (4)

Calculating the actual cost of wages for an 80-liter electric heater

No.	Occupation	Minutes (1)	Minute Pay (2)	Total wages (1) x (2)
1	Heating the water	61	42	2562
2	Keep the water hot	10.5	42	441
3	Store water	82.5	42	3465
4	Connect the power supply	5	42	210
5	The entry and exit of the water	14	42	588
6	Additional aesthetic to the product	15	42	630
7	Packaging the internal contents of the heater	50.5	42	2121
8	Install the heater	14	42	588
9	Metal cleaning	5	42	210
Total cost of wages		257.5	42	10815

We note from the above table that the number of workers in the technological path is large, which carries the product at high costs, while it is possible for the company to reduce the number of workers and invest

their efforts in another field, which leads to reducing the cost of the product and making optimal use of the existing human resources, especially the skilled ones. We also note that the most expensive wages were for the functions of water storage, water heating and packing of the internal contents of the heater.

After the actual material cost has been calculated and the actual wages for each job of the product, it will be done Calculating the total actual cost for each job and for all jobs so that we can calculate the ratio of the cost of each job to the total job costs, and Table (5) shows the process of calculating the total actual cost of the electric heater:

Table (5)

Calculating the total actual cost for each function of the 80-liter conventional electric heater

No.	Occupation	Cost of Materials (1)	Cost of wages (2)	Total cost (1) + (2)
1	Heating the water	18130	2562	20692
2	Keep the water hot	5075	441	5516
3	Store water	18725	3465	22190
4	Connect the power supply	2755	210	2965
5	The entry and exit of the water	2784	588	3372
6	Additional aesthetic to the product	5650	630	6280
7	Packaging the internal contents of the heater	12221	2121	14342
8	Install the heater	8917	588	9505
9	Metal cleaning	1200	210	1410
Total		75457	10815	86272

We note from the above table that the actual cost of the electric heater product, which is calculated on the basis of the product's functions, is (86272) and if it is compared with the green target cost that was previously determined (80750), we find that the difference is (5522), which is the target reduction that the company seeks and who sees The amount of the reduction at first glance will be perceived as a small amount, but if compared to the great benefits that the customer will receive in the long and short term, in the short term the price of the green product will be lower than the prices of traditional products, but in the long term the new green product will contribute to reducing operating costs as it depends on technology It consumes little energy as well as

avoids the consumer the costs of repairing faults that often result from a failure in the heater.

Sixth: Determining the target cost for each job

For the purpose of calculating the differences between the target cost of the green product and the actual cost of each job, the target cost of each job should be determined in order to calculate the difference in order to determine the reduction that will be sought. The target cost of the green product for each job is determined through the following equation:

Green target cost for the job = Green target cost x Actual cost per job ratio

The table shows (6) calculating the target cost for each function of the job by hitting the proportion of the cost function in the green target cost that has already been calculated .

Table (6)

Green target cost for each function of the electric heater capacity of 80 liters

No.	Occupation	Cost ratio (1)	Total Green Cost (2)	Target cost per job (1) x (2)
1	Heating the water	24%	80750	19380
2	Keep the water hot	6.4%	80750	5168
3	Store water	26%	80750	20995
4	Connect the power supply	3.4%	80750	2745
5	The entry and exit of the water	4%	80750	3230
6	Additional aesthetic to the product	7%	80750	5653
7	Packaging the internal contents of the heater	16.6%	80750	13404
8	Install the heater	11%	80750	8883
9	Metal cleaning	1.6%	80750	1292
Total		100%	80750	80750

We note from the above table that the green target cost for the water storage function 20995 calculated by multiplying the job cost ratio of 26% by the green target cost 80750 is the highest among the jobs and this is considered a normal matter because the water storage function is

considered one of the main functions of the heater, followed by the heating water function 19380. it is the main function of the electric heater is the most important of the job, because the goal of the possession of the electric heater is getting hot water when you need it.

Seventh: Calculating the differences between the actual cost and the green target cost

After the green target cost has been determined, it will be compared with the actual cost in order to determine the target reduction in each job in order to reach the green target cost after making the environmental adjustments that the company's engineers see the possibility of adding to the product, and Table (7) shows the differences between the two costs Actual and targeted .

Table (7)

Determine the difference between the actual cost of the electric heater 80 liter capacity and target cost green electric heater eco-friendly 80-liter

No.	Occupation	Actual Cost (1)	Green Targeted Cost (2)	Targeted Reduction (1) - (2)
1	Heating the water	20692	19380	1312
2	Keep the water hot	5516	5168	348
3	Store water	22190	20995	1195
4	Connect the power supply	2965	2745	220
5	The entry and exit of the water	3372	3230	142
6	Additional aesthetic to the product	6280	5653	627
7	Packaging the internal contents of the heater	14342	13404	938
8	Install the heater	9505	8883	622
9	Metal cleaning	1410	1292	118
Total		86272	80750	5522

We note from Table (7) that there are few differences between the actual cost and the green target cost, as the highest reduction percentage was for the water heating function at an amount (1312) calculated by subtracting the green target cost for the job (20692) from the actual cost of the job (19380), followed by a job. Water storage at an amount of (1195) and

then the other jobs come in succession according to the percentage of the pre-determined job cost, but here comes a question about the extent to which this reduction can be achieved for each job after adding the environmental characteristics of the product and is it possible that the process of adding environmental characteristics to one of the jobs leads to Reduction of more than the targeted reduction for other jobs. We will answer this question after publishing the environmental requirements on jobs in the next pages.

Eighth: Determining the percentage of job merit for each job

At this stage, the percentage of job merit (the relative importance of the job) is determined by relying on the field experience of the researcher in the laboratory, the research sample, and by drawing on the opinions of the working team of engineers who specialize in the laboratory and their experience for the purpose of using it in determining the value index for each job in order to refer to it when making the required improvements in designing The product to turn into a green product achieves a competitive advantage for the company. And it was as in Table (8) :

Table (8)

The relative importance of each function of the electric heater capacity of 80 liters

No.	Occupation	The relative importance of the job (Job merit)
1	Heating the water	25%
2	Keep the water hot	12%
3	Store water	23%
4	Connect the power supply	3%
5	The entry and exit of the water	5%
6	Additional aesthetic to the product	5%
7	Packaging the internal contents of the heater	14%
8	Install the heater	10%
9	Metal cleaning	3%
Total		100%

It is evident from the above table that the highest job accrual rate was for the water heating function, which is (25%) because the main function of the electric heater is to provide hot water, followed by the water storage function at (23%) because it is an important job, because without the

presence of the tank there would be no speed in Get hot water.

Ninth: Formulating new environmental requirements

After the engineers have defined the environmental requirements that they would like to add to the product, these requirements should be added and translated in the form of jobs in the current product and amend the parts associated with the performance of the job or add new jobs, and these new environmental requirements are represented by the use of a heater (carbon chips) that consumes little electrical energy. Which contributes to reducing the percentage of gas emissions resulting from electric power generation as well as the use of stainless plastic tubes instead of metal tubes subject to rust and corrosion, with the aim of preserving natural resources, and accordingly these requirements will be formulated by modifying some functions and components of the traditional electric heater as shown in Table (9).

Table (9)

the modified jobs based on the environmental requirements to convert the traditional electric heater to a green electric heater

No.	Occupation	Associated parts
1	Heating the water	Carbon chips
2	Keep the water hot	Insulating material (rock wool)
3	Store water	A cylindrical basin made of galvanized iron, whose cover is made of plastic, in addition to the use of welding material (welding) to connect the parts.
4	Connect the power supply	Dual cable and a small red lamp.
5	The entry and exit of the water	Plastic tubes, two 3/4 and 1 inch bushes, and illustrative stickers
6	Additional aesthetic to the product	Blue colored paint and stabilizers.
7	Packaging the internal contents of the heater	Body made of galvanized iron material, covers made of plastic and welding material (welding).
8	Install the heater	The galvanized iron material is made in cylinder shape and welding material (welding).
9	Metal cleaning	Nitric acid.

Tenth: Calculating the cost of the new heater (carbon chips heater)

After translating the environmental requirements in the form of jobs and

changing the parts related to achieving the environmental requirements, the cost of materials and wages should be determined in order to calculate the cost of the new product and after making adjustments to it to convert it into a green product with the aim of comparing this cost with the actual cost of the traditional product to find out the actual reduction for each job compared to the targeted reduction, Table (10) shows the cost of materials for each modified job as well as the jobs that will be indirectly affected by the modifications .

Table (10)

Calculation of the cost of materials for the electric heater 80 liters capacity after the publication of environmental requirements

No.	Occupation	Material	Quantity(1)	The price (2)	The total cost of the green product (1) x (2)
1	Heating the water	Carbon chips	1	29000	29000
2	Keep the water hot	Insulating material (rock wool)	1.30	3500	4550
3	Store water	Galvanized iron 0.7	10.22	1000	14333
		Aluminum covers	1.225	2960	
		Welding material (welding)	0.500	974	
4	Connect the power supply	Dual cable	1.5	700	1155
		Red lamp	1	105	
5	The entry and exit of the water	Plastic tube	0.3	1500	2200
		Bush 3/4 inch	1	750	
		Bush 1 inch	1	1000	
6	Additional aesthetic to the product	Blue color paint	0.6	8333	5650
		Stabilizers	0.5	1300	
7	Packaging the internal contents of the heater	Galvanized iron 0.7	8.45	1000	9950
		Plastic	1.5	1000	
		Welding material	0.150	974	

		(welding)			
8	Install the heater	Galvanized iron 0.7	5.8	1000	5820
		Welding material (welding)	0.021	974	
9	Metal cleaning		0.1	12000	1200
Total					73858

After calculating the cost of the materials for the new heater (environmentally friendly), we find that it reached (73858) dinars, which is less than the cost of the materials for the traditional product (not environmentally friendly), which is (75457) dinars, as the value of the reduction in the cost of materials is (1599) dinars per unit, but if it is produced The company, with its full production capacity of (2500), will achieve a reduction in the cost of materials in the amount of (3997500) dinars, in addition to what the green product achieves in terms of competitive advantages that increase the customer's satisfaction as an environmentally friendly product and thus increase sales, which leads to an increase in the profits achieved for the company. For the customer, the cost of purchasing the product will be reduced as well as reducing the operating cost because the carbon chips used instead of the heter consume less electrical energy, in addition to avoiding the costs of repairing faults because the life of the carbon chips is 14 years compared to the useful life of the heter which is one year, and to calculate the total cost, the cost should be calculated Wages after translating the environmental requirements into jobs, because the change in materials will contribute greatly to reducing the working times needed to manufacture the electric heater, as shown in Table (11).

Table (11)

Calculation of wages for the new environmentally friendly heater

No.	Occupation	Number of minutes (1)	Minute wages (2)	Total Wages (1) x (2)
1	Heating the water	20	42	840
2	Keep the water hot	8	42	336
3	Store water	62.5	42	2625
4	Connect the power supply	3	42	126
5	The entry and exit of the water	12	42	504
6	Additional aesthetic	15	42	630

	to the product			
7	Packaging the internal contents of the heater	30.5	42	1281
8	Install the heater	14	42	588
9	Metal cleaning	5	42	210
Total		170	42	7140

We note from the above table that the use of carbon chips led to a decrease in the number of minutes spent to manufacture the heater as well as its contribution to the cancellation of some operational processes, which led to a reduction in wages, as the wage cost for the environmentally friendly heater reached (7140) while the wage cost for the traditional heater was (10815). The amount of the reduction is equal to (3675). This decrease in wages resulted from the decrease in times required for manufacturing operations. Table (12) shows the percentage of reduced time, which amounted to 34% :

Table (12)

Calculating the time difference between manufacturing the traditional product and the green product

No.	Occupation	The time consumed for the traditional product	The time consumed for the green product	The difference
1	Heating the water	61	20	41
2	Keep the water hot	10.5	8	2.5
3	Store water	82.5	62.5	20
4	Connect the power supply	5	3	2
5	The entry and exit of the water	14	12	2
6	Additional aesthetic to the product	15	15	0
7	Packaging the internal contents of the heater	50.5	30.5	20
8	Install the heater	14	14	0
9	Metal cleaning	5	5	0
Total		257.5	170	87.5

After calculating the wages for the new electric heater, we can calculate the green cost of the product, as in Table (13) :

Table (13)

The green cost of the new (environmentally friendly) heater has a capacity of 80 liters

No.	Occupation	Cost of Materials (1)	Cost of wages (2)	total cost (2) + (1)
1	Heating the water	29000	840	29840
2	Keep the water hot	4550	336	4886
3	Store water	14333	2625	16958
4	Connect the power supply	1155	126	1281
5	The entry and exit of the water	2200	504	2704
6	Additional aesthetic to the product	5650	630	6280
7	Packaging the internal contents of the heater	9950	1281	11231
8	Install the heater	5820	588	6408
9	Metal cleaning	1200	210	1410
Total		73858	7140	80998

Seen from the table above that the green cost of the new heater amounted to (80998) dinars, while the cost of the actual product traditional equal to (86 272) dinars, achieved a working group to reduce the amount (5274) dinars This means that the target cost of green achieved integration with unassembled analysis lower costs Thus, the product will achieve a competitive advantage in terms of lower cost than the traditional product, as well as the environmental advantages that the customer desires, especially related to reducing electrical energy.

The fourth topic: conclusions and recommendations

First: the conclusions

1. The global trend towards consuming green products is a major driver for directing modern cost-effective technologies towards environmental issues.
2. One of the most important reasons that led to the trend towards using the target cost is the environment in which the economic unit resides, such as a rapidly changing environment, an environment

- characterized by rapid change, for example, the electronic industries sector, and an environment of increasing demand.
3. Green products are distinguished from traditional products in that they take into account environmental standards, starting from the manufacturing stages of the product until its disposal.
 4. Green Target Cost is a technology for pricing green products based on the traditional product price with a price premium
 5. Green target cost technology is considered the most appropriate technology for manufacturing green products, since the process of determining the product cost takes place at the initial design stage of the product.
 6. The high selling price of the electric heater product, as the selling price reached (105,000) dinars, which is higher than the target price for the traditional product by (15,000) dinars and higher than the green target price by (10,000) dinars.
 7. The green target price was determined by adding a green price premium to the target price of the traditional product to meet the environmental requirements, but it was low compared to the benefits of greening the product, reaching (5000) dinars.
 8. The application of the disassembled analysis and the green target cost together contributed to converting the electric heater into an environmentally friendly heater in addition to reducing the cost of the traditional product when it was converted to green, as the cost of the traditional product amounted to (86272) dinars, while the cost of the new green electric heater was (80998) dinars. Thus, a cost reduction of 5274 dinars was achieved, at a rate of approximately 6.1% .
 9. The water heating function did not achieve the target reduction due to the high cost of the carbon chips used instead of the electric heater, as the cost of the job increased by (9148) dinars, but it indirectly contributed to achieving a more reduction than the targeted reduction for other jobs.
 10. Converting the electric heater to an environmentally friendly heater has achieved savings in time as the time consumed to manufacture the traditional heater is (257.5) minutes, while the time consumed to manufacture the environmentally friendly heater reached (170) minutes, thus achieving savings of (87.5) minutes, or 34% .
 11. The company's reliance of the research sample on traditional pricing methods and not taking into consideration external factors when determining the price.
 12. The use of carbon chips will support the possibility of the company obtaining the research sample to obtain the international quality certificate ISO because this heating technology has obtained many

international quality certificates .

Second: Recommendations

1. It is necessary for the economic unit to follow modern cost techniques in calculating the cost of its products in order to arrive at the true cost of the product.
2. The necessity of exploiting the large number of workers in the company, especially the skilled among them, by opening production lines or developing current production lines so that the company does not bear their wages without making use of their capabilities.
3. The need to exploit the application of the green target cost technology because of the necessary capabilities for its application, including machines and equipment, and of skilled individuals.
4. As a result of the researcher finding a green product that is environmentally friendly and at a lower cost than the traditional product, it is possible to work on launching this product in the local markets.
5. The researcher recommends that the research sample company should follow new promotional methods for the green product, explain the features of the green product and its dimensions, and a statement that the new electric heater will achieve savings in the costs of consuming electrical energy in the long term and will spare them the risks of exploding the old heating device as well as avoiding the costs of repairing the faults that result in Traditional geyser.
6. The researcher believes that the company can put its products on the local markets with a specific guarantee for a period of time in order to reflect the image of the customer that the economic unit trusts in its products.
7. The necessity of directing modern cost-effective technologies to serve the environment due to the global trend of concern for the environment due to environmental pollution and the decline of natural resources, especially scarce ones.
8. The necessity of forming work teams of engineers and cost accountants in order to reach developments on the engineering side and on the cost side.

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