

THE ROLE OF GREEN TARGET COST IN ACHIEVING THE ENVIRONMENTAL DIMENSION OF SUSTAINABILITY (AN EMPIRICAL STUDY)

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Extract

The research aims to apply the green target cost technology in (Battery Factory/Babylon Factory 2) as one of the modern and successful techniques that can be used to solve the pollution problems that result from production processes, as well as reduce the problems of misallocation, waste of resources and wrong consumption of energy and time from On the one hand, and identifying the method of producing green products with specifications that meet the environmental requirements and conditions on the other hand, where the research problem was to identify the shortcomings in the traditional method of costs followed in the research sample. The green target in the research sample, training employees and preparing courses for them, and stressed the need to address the obstacles that prevent the existence of an effective cost system that contributes to providing environmentally friendly products.

Keywords: green target cost, green product

Introduction

Environmental interest appeared in the industrialized countries during the eighties of the twentieth century when these countries began to impose environmental legislation and laws on industrial and service companies with the aim of preserving the environment. Preserving the environment and sustainability is necessary and applied by most international companies, and in light of these developments, international companies have started looking for cost-effective methods and methods that lead to reducing the costs of the traditional product to be environmentally friendly and how to Reach clean and pollutant-free production methods in order to achieve environmental sustainability, and from this point of view one of the modern cost technologies has emerged, which is the green target cost, as it is a new technology that supports and enhances the environment. It is also an entrance to cost management that begins at the stage of product design and focuses on the characteristics that must be available in the product and that make it environmentally friendly without sacrificing the basic and important functional characteristics from the point of view of the customer, which negatively affects the quality of the product.

The first topic / research methodology and previous studies

First, the research methodology

1 - Research problem: that environmental pollution has become a problem that the world suffers from as a result of the wrong approach to consuming products that do not have environmental characteristics and the lack of community awareness about the importance of preserving the environment and its resources, As countries continue to face conditions and challenges represented in the decline of natural resources and the significant increase in environmental pollution And the lack of energy sources despite the possibility of using renewable and clean energy, and here the research problem becomes apparent and it becomes necessary to Go to modern techniques, strategies and cost-effective methods such as (green target cost technology), which has a major role in transforming traditional products into environmentally friendly and sustainable products, in accordance with environmental requirements. .

2 - Objective of the research: In light of the research problem presented, the researcher seeks to achieve a number of objectives, which are as follows:

1 - A statement of the knowledge bases and basic concepts of the green target cost technology.

2 - Presentation of a field study in the laboratory (Babel 2), the research sample on how to use the green target cost technique to provide sustainable environmentally friendly products.

3 - Research hypothesis: In light of the research problem and its objectives, the following hypothesis can be formulated:

"The use of the green target cost technology leads to achieving the environmental dimension of sustainability by providing an environmentally friendly product at a low cost."

4 - Limitations of the search:

- A. Spatial boundaries: (The General Company for the manufacture of cars and equipment / batteries factory), affiliated to the Iraqi Ministry of Industry and Minerals, was selected.
- B. Time limits: The reports and data of the battery factory for the year (2021) have been approved, and they are the most recent data obtained.

Second: previous studies

1 - (International performance research institute, 2011)

Entitled: (Green logistics-target costing), the study aims to clarify the direction of strategic cost management for small and medium-sized projects, in addition to the logistical operations of adopting the green target cost for a variety of industries projects, as it was an analytical study, and the study reached several conclusions, including that companies can use green target cost logistics to provide environmentally friendly products, and assist in the processing and development of these products.

2 - (Horvath.et.al, 2012)

Entitled: (Green target costing: Ready for the green challenge), the study aims at the need to intensify efforts to achieve the environmental requirements of stakeholders. Economic units need to balance their business models in a way that is geared towards preserving the environment and facing the green challenge. I was a field study in German companies. The conclusion of the study was that the environmental requirements in the business model of environmentally friendly products compete with traditional products in terms of quality.

3 - (Al- Jadri , 2018) entitled: Using the green target cost and disaggregated analysis to reduce Costs and Achieving a Competitive Advantage The study aimed at explaining why companies are moving towards the green target cost instead of the traditional target cost. The company and the market as a whole.

4 - (Al- Kinani , 2021) entitled: The application of quality function dissemination to improve product value in light of technology

Green target cost the study aimed to present a detailed discussion of the green target cost technology and the supporting techniques and their application to meet the environmental challenges. It was an applied study in the General Company for Textile Industries in Babylon. Good environment, and helps to price these products based on the price of traditional products with the addition of a green price premium

The study was characterized by contributing to the support and protection of the environment by reducing pollution in the factory, the research sample, and solving environmental problems that can be addressed through the green target cost technique.

The second topic:

Concepts and knowledge bases of the green target cost

First, the green product

Despite the recent openness to the concept of environmental sustainability and environmental preservation and consumers' orientation towards green products and the increasing interest of companies in adopting these products, there is still a kind of confusion about what green products represent, as the green product has been defined as "a product designed to reduce negative environmental effects during its full life cycle through the use of renewable and recyclable materials and avoiding the use of environmentally polluting materials" (2010:27, Durif et. al), and the green product was defined "that the green product is the factory according to the concept of green design, and that all production processes, maintenance and distribution of raw materials are going in a way that reduces resource consumption to a certain extent, with the aim of making the product environmentally friendly during its life cycle" (Tasi et al., 2014:68),

Secondly, green product innovation

It means introducing a new or significantly improved product in response to environmental requirements, ie (non-toxic raw materials, green design, less energy consumption, recyclable, low waste of waste). Green innovation is seen as an effective way to reduce costs for both the product and The customer in order to meet the requirements and environmental issues, and companies can implement the innovation of green products by designing them in a way that increases the diversity of its characteristics and functions (Abu Shehata , 2019:41).

And green process innovation is a cornerstone for developing and providing a green product to consumers through modifications that are made in the manufacturing process and systems in order to provide products that meet environmental requirements and needs. Companies can implement green product innovation processes during the manufacturing process in order to reduce the time of the production process and thus reduce costs, note The green process is an activity characterized by the meeting of environmental standards determined by the industry and the social contexts in which operating companies in addition to those established by the markets and customers they aim to serve, taking into account the use of energy, resources, environmental impacts and the issue of sustainability in the design and implementation of the activity (Chiou , 2011: 825-826 et al).

Third: The concept and definition of the green target cost technology

Green Target Costing seeks to provide green products in compliance with environmental requirements because many consumers do not have sufficient knowledge of requirements, in addition to the lack of environmental standards or laws in many industries, and in most cases the interpretation of the term “green” or “Environmentally friendly” is wrong or not understood by most consumers or manufacturers. In the same context, companies and economic units are working to implement the functions of green products desired from the point of view of customers on the basis of withdrawal or payment. Where “pull” means implementation according to the customer's request, while it means “pulling” is the knowledge of green product features created by the company, and that both push and pull increases the perceived value of the customer (Melo et al., 2016 :3).

Nishimora defined it as “a technique that relies on the idea of merging environmental costs with the traditional target cost, for example, when setting the target price, an amount of costs must be added to it, known as the green price premium, and the use of the green kaizen method” (Nishimora , 2014:56).

As Hendricks defined it, “It is the process of employing target cost technology and using it in developing an environmental sustainability strategy, and it is possible that the green target cost is a useful tool to provide assistance in determining the permissible cost of the product, since consumers are often not willing to bear the additional costs of purchasing the product” (Hendricks, 2015). , 11).

Al- Jadri defined it as “it is a technology developed from the traditional target cost in response to the increasing desire of consumers to obtain environmentally friendly products at an appropriate price, and the desire of companies to achieve that goal” (Al- Jadri , 2018:41).

Fourth: Steps to implement the green target cost

After developing the traditional concept of target cost, several steps were reached to implement the green target cost, which are:

1- Determining the required green jobs: Environmental requirements are derived from the study of market data, such as information about the industry and sustainability reports of competing companies (Al- Jadri, 2018:42).

2- Determining the target selling price and green price premium: After determining the appropriate product specifications for the customer, the target selling price for the product is determined, through analysis of market data and feedback to customers. 2012:28, Horvath & Berlin).

3 - Adjusting the green profit margin and calculating the legal costs: based on the target price, the legal cost is determined by deducting the target profit margin from the target price. To determine the target profit margin, long-term profit plans and profits from previous years are used, and it is the most widely used measure. It is the return on sales because its calculation is simple and can be linked with the profitability of each product (Berlin et al., 2011: 64).

4 - Distribution of costs to green cost vectors: In this step, the legal costs for each part of the product are determined, then the value perceived by the customer is set for the characteristics of each part of the product, and the definition of each part and its importance, and then understand the engineering of the product and the possibility of simplifying it based on the value perceived by the customer, this is usually through functional analysis that works to identify the parts of the product and study the function of each part and note the parts whose cost is greater than its benefit, and these parts are re-designed so that their benefit is greater or equal to their cost (Horvath & Berlin, 28 2012).

5 - Implementation of green target cost management metrics: This step includes three stages (actual costs of the parts are determined, the actual cost is compared with the allowable (target) cost for each part of the product, the deviation is determined and analyzed in order to improve the design of the parts and reduce the total cost without negatively affecting functionality and quality), the actual costs are compared with the payable costs of each part to determine the value index, where the value index for each part indicates how high or low the costs of a particular part are to determine the perceived value to the customer (Berlin et al. 2011:86).

6. Green kaizen cost: whether the permitted costs are achieved or not, efforts are continued with the aim of continuous improvement, as green kaizen adaptation is nothing but an extension of its traditional concept towards environmental issues, as it helps control cost reduction and environmental improvement measures that are very ambitious, that the first part of the cost of green kaizen is the actual cost report updated periodically, while the second part in the figure

is the update of the actual environmental impacts, the third is the update of the effectiveness of each measure (Al- Kinani , 49-50: 2021).

The third topic

Applying the green target cost technology in (Battery Factory / Babylon 2 Factory)

First: Defining the economic unit, the sample of the research

Babel 2 factory was established in 1982 to produce different types of standard liquid batteries according to international specifications and Iraqi specifications no. (81) and with distinction from the English company Coloride , that (Babylon 2) factory is one of the main formations in the battery factory and as mentioned previously, and shares a large part of the total costs of the battery factory are due to the fact that the (Babylon 2) plant is still its continuing production operations and offers its products in the local markets, where the production capacity in the (Babylon 2) plant annually reaches (500,000) standard liquid batteries, with the following capacities (A55 , A60, A75, A90 (A135,150,A180), and this battery bore the "Babylon" mark.

Third: The application of the green target cost technology

The application of the green target cost technique is to be applied to the A55 liquid lead battery product, as follows:

1 - Defining the function of the current product: The liquid battery product is considered one of the necessary products in human life as it is used in the operation of transport vehicles of various kinds, and it is used as storage units in solar cell panels. Lead batteries are used in the form of plates of raw lead and pure lead peroxide. It is immersed in a box of diluted sulfuric acid with a concentration ranging from 33 to 37 percent, as it works on the principle of converting chemical energy into electrical energy. Uninterruptible feeding units (electrical inverters), and based on what was mentioned, the function of liquid batteries is to generate electric power.

2 - Determining the green target selling price: The target price is determined by studying the market and the competing products in it. Table No. (1) shows us the most important competitive products and the prices of each of them as follows:

Table No 1: Prices of Competitive Products

S	product name	Origin	Price (in dinars(
1	HANKOOK	Korean	69,000
2	TROJAN	American	58,000
3	INDIGO	Korean	65,000
4	SOLITE	Turki	55,000
5	ROCKET	Chinese	50,000
6	EXPRESS	Thai	57,000
7	LUMASS	Turki	52,000
8	SMART	Turki	50,000
9	Total		456,000

Target price = total prices of competing products ÷ number of competing products

Target price = $456,000 \div 8 = 57,000$ dinars

We note from the above table and equation that we reached an amount of (57,000) representing the target selling price.

3 - Determining the green price premium: Since the management of the Babel 2 plant aims to provide an environmentally friendly product, this requires consumers to pay a price premium known as (the green price premium) that is added to the target price of the traditional product and through which features are added that meet the environmental requirements, and depends on the extent of consumers' willingness to pay this price premium, depending on the extent of their awareness of the importance of moving towards preserving the environment, because of the The desire of the (Babylon 2) factory to promote its competitive reality and raise the reputation of the local product, so the environmental costs of pollution will be calculated because the factory raises many pollutants that cause damage. The environment during the production process, as the (Babel 2) plant spends additional costs in order to reduce these pollutants, which are as follows:

Table No. (2) Environmental Cost Report

s	Details	sums
1	Environmental costs of reducing pollution	22,180,000
2	Environmental costs of reducing water pollution	12,590,000
3	Environmental costs of reducing air pollution	570,000
4	total environmental costs	35,340,000
	Total environmental costs of the battery	35,340,000 Dinar $11780 \div$ unit 3000Dinar per unit

Based on the foregoing and in accordance with the tables and equation shown above, it was decided to add (3,000) dinars as a green price premium to the product, which is considered relatively small, in order to avoid the risks of consumers rejecting the product Due to its high price compared to competitors, so the green target price of the A55 battery will be (60,000) dinars.

4- Determining the green target profit margin: The Babel 2 factory in general depends on 10% representing the profit rate for the products according to the philosophy of the factory, but since the management of the Babel 2 factory wants to provide an environmentally friendly product, this will expose the product to high market risks for that. An additional fee must be added to the profit margin at the rate of 50% of the normal profit margin. The target profit margin will be calculated through the following equation:

Green Target Profit Margin = Green Target Margin x Green Target Profit Margin Ratio

Green target profit margin = $(60,000) \times (15\%) = 9,000$ dinars

5- Determining the green target cost: in which the green target cost of the environmentally friendly liquid battery that the Babylon 2 plant would like to present and put to the market is

calculated. The green target cost is determined according to the green target price, which was determined according to the target price for traditional products in addition to the green price premium. The green profit margin is subtracted from the green target price to reach the green target cost as in the following equation:

$$\begin{aligned} \text{Green target cost} &= \text{green target price} - \text{green target profit margin} \\ &= (60,000) - (9,000) = 51,000 \text{ dinars} \end{aligned}$$

6- Conducting a functional analysis of the current A55 liquid battery: In this step, the data collected for each function of the A55 liquid battery is analyzed, in order to know the parts and components associated with each function in terms of characteristics, advantages and requirements, and to clarify the function and the physical components that It is associated with each function and accordingly the functions of the A55 liquid battery are identified and divided into main functions and secondary functions of the components. The functions of the liquid battery are (generation and storage of electricity, insulation and safety, conduction, assembly of product components, aesthetic addition to the product)

7- Determining the actual direct raw materials cost for each job: The actual direct raw materials cost for each job must be calculated for the purpose of calculating the actual direct raw materials cost ratio for each job in the product to the total actual cost of all jobs, the following table shows us the quantity and price of materials The priority required for each job:

Table No. (3) Calculation of the actual cost of liquid battery materials A55 (amounts in dinars)

S	Function	Material	Quantity (1)	purchase (2(price	Total materials (2(cost (1) x
1	Electricity generation and storage	positive plate	30	225.667	6,770
		negative plate	36	163.639	5,891
2	Insulation and safety	circumstantial insulator	30	37.067	1,112
3	Delivery	poles	2	674	1,348
		lead rings	2	674	1,348
		bullet flags	24	888,833	2,132
		connectors	10	240.2	2,402
4	Product components assembly	BoxA55	1	1154	1,154
		CoverA55	1	332	332
		solution stoppers	6	9	54
5	Aesthetic addition to the product	plastic ruler	1	37	37
		plastic rings	2	48	96
		clamps	2	15th	30
		tag	1	250	250
6	The total cost of the actual raw materials				22,956

After calculating the actual cost of direct raw materials for each of the jobs by collecting the components associated with each job, the actuals of the jobs must be determined, and for the purpose of calculating wages for one battery by multiplying the average annual wage of The

worker by the number of workers in the (Babylon 2) factory, we will calculate and detail the total The annual wages of workers in the (Babylon 2) plant and the derivation of the cost of wage wages through the actual production, as in the following equation:

The total actual wages of the Babel 2 factory = the average annual wage of the worker x the number of workers in the Babel 2 factory

$$= 9,020,108 \times 617 = 5,565,406,636 \text{ dinars annually}$$

The cost of the wage of one battery = the total actual wages of the Babylon 2 plant ÷ the actual units produced

$$= 5,565,406,636 \div 11,780 = 472,446 \text{ dinars annually}$$

The cost of the worker's wages per battery = the cost of the battery's wages ÷ the number of workers for the Babel 2 plant

$$= 472,446 \div 617 = 765.714 \text{ dinars/worker}$$

After the actual direct raw materials cost and actual wages have been calculated for each function of the product, we will calculate the total actual cost for each job and for all product functions, as in the following table:

Table No. (4) The total actual cost of each of the functions of the A55 battery (amounts in dinars)

Total actual cost	* annihilations	service supplies *	wage cost	Material cost	Function	S
204.51 4	2,026	695	189,132	12,661	Electricity generation and storage	1
49,26 9	508	175	47,474	1,112	Insulation and safety	2
134,61 4	1,345	462	125,577	7,230	Delivery	3
81,54 4	845	290	78,869	1,540	Product components assembly	4
32.2 58	336	115	31,394	413	Aesthetic addition to the product	5
502, 199	5,060	1,737	472,44 6	22,956	the total	6

Calculating the ratio of the cost of each job to the total job costs: During this step, the ratio of the cost of each job to the total costs will be calculated in order to calculate the percentage of the green target cost to measure the differences between the actual cost and the green target cost, this will be done through the following equation:

$$\text{Percentage of cost per job} = \text{job cost} \div \text{total job cost}$$

The following table shows us calculating the cost percentage of each job by dividing the cost of each job by the total job costs of the product:

Table No. (5) Percentage of job cost for A55 liquid battery product (amounts in dinars)

Functional cost ratio	Actual cost	Function	S
41%	204, 514	Electricity generation and storage	1
10%	49, 269	Insulation and safety	2
27%	134, 614	Delivery	3
16%	81, 544	Product components assembly	4
%6	32, 258	Aesthetic addition to the product	5
%100	502, 199	the total	6

In order to calculate the differences between the green target cost and the actual cost for each job (functional cost ratio) of the product jobs, the green target cost for each job must be determined for the purpose of calculating the difference in order to determine the reduction that will be worked on to reach it. Determining the green target cost for each job will be through the following equation:

Green Target Cost of a Job = Green Target Cost x Actual Cost Per Job Percentage

9 - Calculating the difference between the green target cost and the actual cost: After calculating the green target cost for the product, it will be compared together with the actual cost of each job in order to reach the target reduction amount for each job, in order to reach the green target cost after doing the environmental adjustments proposed by the engineering team in The plant for all product functions, Table No. (6) Shows the differences between the actual cost and the green target cost:

Table (6) the difference between the actual cost and the green target cost of the A55 liquid battery (amounts in dinars)

Target reduction	green target cost for the job	Actual cost	Function	S
183,604	20,910	204,514	Electricity generation and storage	1
44,169	5,100	49,269	Insulation and safety	2
120,844	13,770	134,614	Delivery	3
73,384	8,160	81,544	Product components assembly	4
29,198	3,060	32,258	Aesthetic addition to the product	5
451, 199	51,000	502, 199	the total	6

From the previous table, it is clear that there are significant differences between the actual cost and the green target cost, which is represented by the negative cost gap of (451,199) dinars.

10 - Reducing the cost of direct raw materials and making the product environmentally friendly: In order to make the liquid battery product environmentally friendly, as shown above, the researcher suggests replacing antimony and arsenic with bismuth, which is a substance and a natural element that has the same chemical and physical properties in terms of the degree of solubility and thermal insulation ability. The electrical conduction of the aforementioned two elements, and it is used in the alloy industry by mixing with lead, tin and copper usually to enter into many industries, and this proposal achieves the previously mentioned benefits as well as achieving a reduction in costs as shown in the following table:

Table No. (7) The reduction in costs based on the proposal (amounts in dinars)

Cost	Quantity in kg	Subject	S
5,481	0.151	Antimo n	1
2,609	0.063	arsenic alloy	2
8,090	the total		
1,691	0.214	bismuth	3
6,399	Reduction amount		

The previous table shows that the reduction in the cost of the direct raw materials involved in the manufacture of the liquid battery is (6,579) dinars.

11 - Reducing the cost of direct wages: the factory suffers from a very large functional slack, the researcher will adopt the actual need of workers, i.e. calculating the cost of wages based on the workers entering the production process only (70) workers, which is consistent with the available production capacity of the (Babylon 2) factory), the amount of the reduction in the cost of wages will be clarified based on the proposal as follows:

$$9,020,108 \times 70 = 631,407,560$$

Through the previous equation, it is found that the cost of wages after the reduction is (631,407,560) dinars and after dividing by the number of units produced amounting to (11,780) units, the battery after the reduction will be (53,600) dinars

12 - Reducing the cost of indirect expenses: The indirect industrial expenses that can be reduced in the Babel 2 plant are represented in the cost of service supplies as in the detailed trial balance, amounting to (20,461,950) dinars, equivalent to (1,737) dinars per battery, knowing that the basis of distribution is for the cost of service supplies The service requirements by the costing unit are not accurate at all, as the (Babylon 2) lab bears the cost of service supplies in excess of the actual entitlement, and thus The cost of service supplies can be reduced to 50% of the current cost so that it will become (10,230,976) dinars and the equivalent of (869) dinars The unit battery, which complies with the manufacturing requirements of the liquid battery product.

12 - The cost of the new product after the process of reducing costs and closing the gap: After applying the green target cost technique, the cost savings will be clarified in addition to the cost of the new product, as in the following table:

Table No. (8) The reduction in costs after applying the researcher's suggestion (amounts in dinars)

The current cost of the product	achieved reduction	the details	S
502,199		Product cost according to the traditional system	1
	(6,399)	Replacing antimony and arsenic with bismuth	2
	(418,845)	Reducing the number of employees	3
	(869)	Reducing the cost of indirect expenses	4
(426,113)		total discount	5
76086	(1-9) (The current cost after making adjustments and improvements		6

Through the previous table, it becomes clear to us that the cost of the battery after the reduction is (76,086), which is the maximum that the researcher was able to reach, due to the limited resources and the factory's lack of modern manufacturing elements. Green products have a relatively high cost.

The fourth topic

Conclusions and recommendations

First: the conclusions

1 - The world has witnessed a great trend towards consuming environmentally friendly products for its great role in preserving natural resources and reducing the percentage of pollutants and waste that negatively affect human health and the environment. Therefore, it became obligatory for companies to adopt this approach to ensure their continuity in the market by meeting the desires of consumers.

2 - The green target cost technology is considered one of the important techniques in the field of environmental protection by designing green products in accordance with environmental conditions and with high quality and in a manner that achieves the benefit of the consumer, company and society.

3 - Green products are distinguished from traditional products in that they focus on improving environmental performance and have been designed and manufactured in accordance with environmental standards and conditions, and in a manner that ensures that they meet the desires of consumers without affecting the main characteristics and quality of the product.

Second: Recommendations

1 - Showing interest in the cost system applied in the battery factory and introducing modern cost techniques in it in order to calculate the costs of its products to reach the actual cost of the product and to show the environmental impacts and costs that can be avoided when applying environmental standards.

2 - Introducing the new battery product after environmental improvements have been made to the market and promoting it as a green, recyclable product with a warranty period higher than competing products in order to reflect an image to consumers that the battery factory trusts the products it offers.

3 - Spreading environmental awareness in society and introducing environmental culture into the lives of workers and consumers and informing them of the importance of consuming environmentally friendly products through targeted cultural programmes.

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