A PROPOSED MODEL FOR REDUCING COSTS IN LIGHT OF THE SUSTAINABILITY ACCOUNTING STANDARD FOR CONVERTING RESOURCES TO ELECTRICAL AND ELECTRONIC EQUIPMENT. A STUDY OF BABYLON FACTORY 2 FOR BATTERIES

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Abstract :*The main objective of the research is to demonstrate the application of the sustainability accounting standards (SASs), the standard for transferring resources to electrical and electronic equipment (EEE) to reduce costs. this will achieve what the dimensions of sustainability (economic, environmental, social) seek, in addition to reducing production costs and improving the quality of the battery, as well as reducing costs by relying on the actual need for workers in line with the requirements of sustainability. The study obtained the analytical-descriptive approach to collect data. The Babylon Facotry 2 is the sample of the study. The researchers used various data source incluing financial statement in the factory, interview with some engineers and techniacians. The study found that applying sustainability accounting standards, especially the standard of converting resources to electrical and electronic equipment, will maintain product safety and help manage hazardous waste (liquid and solid) for the purpose of preserving the environment and reducing costs. Many recommendations were reached, the most important of which is that industrial companies should adopts the standard of covertion resources of electrical and electronic equipment, for reducing costs.*

Keywords*: Cost reduction, electrical and electronic equipment, EEE, hazardous waste management, product safety, resource conversion standard, RCSs.*

INTRODUCTION

Due to the advanced modern technology and rapid developments in the industry, the prosperity of global economy has led been revitalized. However, such development has also harmed the environment due to the waste generated by these industries. Industrial companies are the main cause of waste and emissions produced during their production processes, which has increased their costs due to costs required for environmental treatment.

The focus on environmental costs is no longer limited to developed countries, but extends to developing countries as well. This foucs requires the adoption of sustainability accounting standards (SAS), especially the standard for converting resources into electrical and electronic equipment. To solve the problem, the research is based on the hypothesis that the standard for converting resources into electrical and electronic equipment reduces costs.

RESEARCH PROBLEM

The problem of the research lies in the increase in product costs due to the failure to keep up with current developments, specifically the adoption strategies related to environmental and sustainable costs, especially the standard for converting resources into electrical and electronic equipment. The problem can be clarified through the following questions:

1. Can industrial units, with their increased product costs, compete with other units? Is it possible to reduce the costs of industrial products under the standard for converting resources into electrical and electronic equipment?
2. Is it possible to apply (sustainability accounting standards) the standard for converting resources into electrical and electronic equipment to reduce costs?

Research objectives

This research aims to achieve the following objectives:

1. Defining the concept of the standard for converting resources into electrical and electronic equipment as one of the sustainability accounting standards;
2. Proposing a model for cost reduction under the standard for converting resources into electrical and electronic equipment.

Research importance

The importance of the research lies in adopting the standard for converting resources into electrical and electronic equipment as one of the SAS to reduce the costs of battery factory (Babylon factory 2) belonging to the General Company for Automotive and Equipment Industries. Additionally, this will lead to obtaining a good competitive position for these industrial units in the market which helps improve the performance of Iraqi industrial units.

Research hypothesis

The research aims to test whether the standard for converting resources into electrical and electronic equipment contributes to cost reduction.

LITERATURE REVIEW

Resource conversion standards (RCSs)

Resource conversion standards for electrical and electronic equipment include a set of disclosure guidelines on sustainability issues specifized to the unit's industry, which are ultimately responsible for identifying essential information. In addition, these standards provide units with sustainability metrics to improve units' performance on sustainability issues at the industry level. RCSs consist of a set of specialized standards such as chemicals, machinery, equipment, and other resource conversions. This standard discusses a set of specialized standards as shown in Table 1 below:

Table 1 *Resource Conversion Standards*

	Standards
1	Chemicals
2	Aerospace & Defense
3	Electrical & Electronic Equipment
4	Industrial Machinery & Goods
5	Containers & Packaging

The sustainability accounting standards board (SASB) determine sustainability topics at the industry level, which may constitute essential information based on the company's predetermined operating context. The SASB aims to provide guidance to management in units that are ultimately responsible for identifying essential information. Additionally, SASB provide units with sustainability metrics that are designed and standardized to improve performance in sustainability issues. Units can use SASB to ensure consistent, useful, comparable, and complete disclosure (SASB, 2017). Due to the special importance of the industrial sector and its effects on humans and the environment, the standard for electrical and electronic equipment, which represents the seventh set of SASs issued by the SASB, will be discussed in detail as the standard in the resource conversion standards group.

Electrical & electronic equipment

The electrical and electronic equipment (EEE) industry includes the development and manufacturing of a wide range of electrical components, including power generation equipment, power transformers, electric motors, keypads, automated operation equipment, heating and cooling equipment, lighting, and transmission cables. EEE includes non-construction commercial and residential building equipment, such as heating, ventilation, air conditioning systems, lighting fixtures, security devices, elevators, electric power equipment. EEE also composes traditional power generation and transmission equipment and renewable energy equipment, industrial automation controls, measuring tools, and electrical components used for industrial purposes like files, wires, and cables. Units in this industry operate globally and generate a significant portion of their revenue from outside their home country. SASB has identified the following sustainability disclosure topics for this industry:

ENERGY MANAGEMENT

The electrical and electronic equipment industry includes the development and manufacturing of a wide range of electrical components, including power generation equipment, power transformers, electric motors, keypads, automated operation equipment, heating and cooling equipment, lighting, and transmission cables. This includes non-construction commercial and residential building equipment, such as heating, ventilation, air conditioning systems, lighting fixtures, security devices, elevators, electric power equipment, including traditional power generation and transmission equipment and renewable energy equipment, industrial automation controls, measuring tools, and electrical components used for industrial purposes, including files, wires, and cables. Units in this industry operate globally and generate a significant portion of their revenue from outside their home country. SASB has identified the following sustainability disclosure topics for this industry:

A- Energy Management

Energy is an important input for creating value for EEE companies due to energy-intensive manufacturing processes. Purchased electricity represents the largest share of energy expenses in the industry, followed by purchased fuels. Since electricity production contributes significantly to gas emissions and air pollution through the burning of fossil fuels, the cost of the electricity grid may increase. Since the extraction, production, and use of fossil fuels contribute to significant emissions of gases and environmental externalities, the cost of purchasing fuel may also increase due to mitigation efforts. Furthermore, the use of on-site generated electricity instead of grid-derived electricity and the use of alternative energy can play an important role in affecting the cost and reliability of energy supplies, as well as profitability and risk management. The specific metrics for energy management can be shown in the Table 2 (SASB, 2017).

Table 2 *Energy Management Metrics*

Issue	Measure	Category	Measurment unit
Energy Management	$\frac{\text{Consumed energy}}{\text{Total power consumed from the network}}*100$	Quantitative	**Percentage**
	$\frac{\text{consumed renewable energy}}{\text{total renewable power}} * 100$	Quantitative	**Percentage**

B- hazardous waste management

EEE units face regulatory and operational challenges in managing their manufacturing waste. Many of these materials can be hazardous to human health and the environment. Therefoer, they subject to hazardous waste regulations at the international level. Proper treatment and disposal of hazardous waste materials is essential to reduce the risks of liability and fines. In addition, units capable of reducing input waste and recycling generated waste can achieve significant cost savings and improve profitability. The specific metrics for hazardous waste management according to SASB (2017) can be dispolayed in the Table 3.

Table 3 *Hazardous waste management metrics*

Issue	Measure	Category	Measurment unit
Hazardous waste management	$\frac{Weight\ of\ reused\ hazardous\ waste\ materials}{Total\ weight\ of\ hazardous\ waste} * 100$	Quantiative	Metric ton (ton) percentage (%)
	Number and total quantity of leaks reported	Quantiative	kilogram (kg)

	and the quantity returned		

c- Product safety

Appropriate safety procedures and testing for electrical equipment units can help reduce the risks of reputation associated with recovery operations, protect sales. It also prevents injuries and even accidental deaths among EEE users. In case of the current and future product quality and safety are not effectively managed, it may lead to significant product liability claims and potential regulations through proper design and testing. Furthermore, industry units can improve performance in product safety. Neverthless, units with poor product quality and safety may suffer revenue losses due to reputation damage, redesign costs, recalls, lawsuits, fines, etc. The specific metrics for product safety to SASB (2017) can also be explained in Table 4.

Table 4 *Product safety metrics*

Issue	Measure	Category	Measurment unit
Product safety	The number of withdrawals and the total units withdrawn	Quantiative	**Numerical**
	The amount of legal and regulatory fines and settlements associated with product safety	Quantiative	**US Dollars**

D- Product life cycle management and innovation

EEE units encouter increasing challenges and opportunities related to external environmental factors during the stages of product usage on the negative side. Regulations push EEE units to avoid or minimize the use of chemicals in their products as much as possible, in addition to regulatory and customer pressure to reduce the environmental footprint of their products. Primarily in terms of energy density, EEE units that develop cost-effective energy-efficient products and solutions can benefit from increased revenue and market share, identify stronger competitive positions, and enhance brand value. Similarly, products and services that solve major environmental problems can represent significant market opportunities. The specific metrics for product life cycle management and innovation for environmental efficiency can also be explained according to SASB (2017) in the Table 5.

Table 5 *Product life cycle management and innovation metrics for environmental efficiency*

Issue	Measure	Category	Measurment unit
Product life cycle management and innovation to achieve environmental efficiency	Percentage of products by revenue that contain IEC 62474 Add. materials	Quantiative	**percentage of revenue**
	The percentage of qualified products by earnings that meet ENERGY STAR criteria	Quantiative	**percentage of revenue**
	Revenue from products related to renewable energy and energy efficiency	Quantiative	
	Total energy cost savings achieved through energy performance contracts	Quantiative	

<u>E- Material Sourcing</u>

EEE units are exposed to supply chain risks when using metals and rare earth metals in their products, which will help proactive supply chain auditing and management isolate units from reputation and regulatory risks. Supply risks associated with rare earth metals and conflict site minerals can be traced back to low substitution rates and concentration of deposits in only a few countries, as well as geopolitical considerations. All conflict minerals - tin, tantalum, tungsten, and gold - are used in the manufacture of electronic equipment, and compliance with these new regulations can represent a significant cost for units. Units in this industry also face competition due to increased global demand for these metals from other sectors, which may lead to significant price increases and supply risks. Benefits can be earned through the ability of unit to quickly reduce reliance on conflict and rare earth metals and comply with all current and future forms of regulation. Yet companies are able to reduce the use of critical and conflicting materials, as well as secure their supplies, not only from environmental and social external factors related to extraction but also protect themselves from supply disruptions and input price volatility. The specific metrics for material sourcing can also be explained according to SASB (2017) in Table 6.

Table 6 *Material sourcing metrics*

Issue	Measure	Category	Measurment unit
Material Sourcing	Material cost ratio for products that contain critical materials $\frac{Cost\ of\ raw\ \ critical\ materials}{\text{total cost of raw materials}} \times 100$	Quantiative	%
	Percentage of tungsten, tin, tantalum and gold smelters within the supply chain that are verified to be conflict-free	Quantiative	%
	Discussing risk management associated with the use of critical materials and conflicting metals	Discussing and analysis	**n/a**

Based on the preview, the researchers believe that the criterion for transferring resources to EEE should be employed and adapted in line with the current reality of general industrial companies operating in the Iraqi environment, especially the subject of research. They lack attention to the aspects and dimensions referred to by the economic, environmental and social criterion. In view of the importance of the criterion of transferring resources to EEE in reducing costs, therefore, cost reduction, entrances to reducing costs, and principles of cost reduction will be dealt with.

Cost reduction

Costs are a requirement for conducting activities, and they are the essence of their operations. They are also indicators of the performance of operations and therefore the performance of the unit as a whole. Costs are considered factors for the continuity and success of the unit, as achieving a competitive advantage is possible through them (Sorour, 2020). The growth and success of units depend on their ability to focus on cost reduction. This can increase their profits and support their competitive position (Handhal, 2017). Cost reduction is an integrated system, and one of the responsibilities of cost managementis that covers all activities related to the costs incurred by the unit. These activities include predicting future costs, estimating the financial allocations necessary for each production element, preparing estimated budgets, controlling costs, and preparing reports for unit management that include deviations (Radhakrishana & Salan, 2017).

Abdul Qadir (2019) defined cost reduction as the process of reducing one unit of the product or service by using cost management techniques to reduce costs during all stages of the value chain to achieve financial savings and reduce the selling price, but by a lower percentage than reducing the cost to the customer and increasing profits. Similarly, Kazem (2020) perceived it as a planned method aimed at improving production efficiency through increases in production units and optimal use of cost elements that will lead to a reduction in costs per unit while maintaining product quality. Drury (2018) pointed out that reducing costs require the unit maintains its competitive advantages by reducing product or service prices while maintaining quality and increasing customer satisfaction and value by increasing revenues and profits that reflect additional value to shareholders. Akeem (2017) perceived const reduction as a planned approach represented by the use of techniques and methods that are more acceptable and efficient than previous standards and techniques to control operating costs and ensure that the cost does not exceed a certain amount by eliminating wasted time and achieving an increase in production.

Accordingly, cost reduction can be defiend procedurally as an approach adopted by the unit to manage its costs by using one of the cost management techniques to reduce costs through the optimal use of cost elements and increasing productive units.

Approaches to cost reduction

There are two main approaches to cost reduction (Kazem, 2020).

Traditional approach to cost reduction aims to reduce costs according to established standards, whether under the standard cost system or the budgetary planning system, through analyzing variances and their causes.

Modern approach to cost reduction uses cost management techniques to reduce costs. These techniques include target costing to reduce costs in the research, development, and design phase and continuous improvement methods to reduce costs in the production phase, as well as all other cost management techniques. It should be noted that modern cost management techniques analyze costs in all areas, and therefore these techniques work on reducing costs.

Principles of cost reduction

Musa (2012) argued that production units need to consider the following basic principles for cost reduction:

1. Determining the elements that cause high costs and compare them to other elements.
2. Considering the cost of study and analysis, ensuring that it does not exceed the cost reduction.
3. Maintaining product quality and ensuring that cost reduction does not lead to a reduction in product quality.
4. Avoiding making strategic mistakes due to cost reduction.
5. Avoiding undermining the morale of workers, which affects productivity.

Therefore, cost reduction principles relate to maintaining the efforts and morale of workers and making decisions that are in line with cost reduction without compromising product quality. The study and analysis phase of proposals should focus on cost reduction, and cost reduction should achieve the goals of the economic unit.

Motivations for cost reduction

Bragg (2010) idenfified some motivations that make units tend towards the process of reducing their costs:

1. The decrease in revenue, where the need for cost reduction begins. Units must observe the prices of competitive units to determine the appropriate price. High prices provide an opportunity for new competitors to enter the market easily, leading to a significant reduction in prices by these competing units. This is a problem faced by most units where their product prices exceed those of competitive products.
2. Increasing in fixed costs represent a large proportion of the unit's total costs because they use high levels of automation. High fixed costs mean that the unit must operate at maximum capacity to achieve profits. This is a significant problem where every unit with high fixed costs will try to reduce the prices of its products to ensure its survival and continuity.
3. Complexity of operations lead over time operations become more complex, such as expanding the offering of new products, which requires an increase in costs due to inflation. Therefore, units must control and reduce costs.

Thus, the costs reduction under the criterion of transferring resources to EEE, the activity of research, development and design to the end of post-production, the costs associated with marketing activities, after-sales services activities, and the costs of reuse and remanufacturing, which include the costs of reuse and remanufacturing in order to benefit from production residuals and remanufacture them, and the savings that produced from it, and results appear through the above in the long term and in light of (the standard of transferring resources for EEE), which is focused on reducing costs, and the current reality of the cost system in Babylon factory 2 will be addressed.

METHODOLOGY

Research design

The current research deals with a presentation of the research methodology used, which is represented in the research problem, its hypothesis, its objectives, and its importance, in addition to its temporal and spatial limits, method and sources. The study used the contant analysis and descriptive approaches for data collection and analysis. The study fouced on Babylon battry production factory 2 in the financial year 2021.

Settings

This research was limited to the financial statements for the year ending in 31-12-2021 for being available. The study focused on General Company for Automotive and Equipment Industries as the publation of this research. The Babylon Factory2 for battery production was chosen as the sample due to the availability of information that helps clarify the idea of research.

Sample and instruments

Data were collected form several sources including the Factory Cost Unit records for the year 2021. The researrchers relied on personal interviews and field experience with the factory and contacting one of the agents selling calcium. They also interviwed several engineers and technicians in the Babyln factory 2

RESULTS AND DISCUSSION

Costing system in force in the Babelion Factory2 for batteries

The cost accounting system implemented in any unit is the main source relied upon in making all operational and strategic decisions such as pricing, production, evaluation, control, as well as decisions related to production lines. This is done through the information provided to management whenever needed. After reviewing the actual costs calculated in the battery factory. It became clear that the Babylon Factory 2 for batteries applies the unified accounting system (UAS) in analyzing and presenting its accounts and cost elements. The system is divided into four main sections starting with salary calculation, symbolized by 31, and ending with depreciation calculation, symbolized by 37. The factory produces liquid and dry batteries of different sizes depending on the raw materials manufactured in the lead smelter for the company, as well as imported raw materials used in battery manufacturing.

Method of calculating and analyzing the cost of a standard A60 liquid battery are:

A. Determining the cost of raw materials used in producing the standard liquid battery (A60).
B. Determining labor costs as follows:
1. The salaries of workers involved in the production process are calculated from the detailed cost budget, which amounted to (3396141000) dinars annually.
2. The number of workers involved in the production process was 453 workers (source: Human Resources Unit).

C. The annual worker wage rate is calculated by dividing the salaries of workers involved in the production process by the number of workers involved in the production process according to the following equation:

Annual average worker wage = salaries of workers involved in the production process ÷ number of workers

3396141000÷453=7497000 dinars

D. To calculate the number of actual working days, days off like Fridays, Saturdays and official holidays are calculated using to the following equation:

Fridays, Saturdays and annual official holidays = Fridays and Saturdays per month x 12 months + official holidays

8 x 12 + 14 = 110

E. The number of production days per year is determined by subtracting Fridays, Saturdays and official holidays from the number of days of actual annual production using the following formula:

The number of actual production days in a year = the number of days in a year - Fridays, Saturdays and public holidays

=365 – 110 = 255

F. The daily working hours are calculated by calculating the total working hours minus the time of attendance and departure, as shown in the following equation:

Actual working hours = total working hours - attendance and departure time

=8 hours - 1 hour

= 7 actual working hours

G. After that, a wage hour is calculated for a worker through the following equation:

The wage hour = the worker's wage per day ÷ the actual working hours per day

= 29400 ÷ 7 = 4200 dinars

H. The standard time specified by the Planning Department for the production of one battery is 2.5 hours. To calculate the wage for the production of the A60 liquid battery, the following equation is used:

Liquid battery operating costs = wage hourl x standard battery production time

= 4200 x .5 2 hours = 10500

It can be shown clearly in Table 7.

Table 7 *Calculation of operating costs*

ت	Details	Amounts in dinars
1	**Salaries of workers involved in the production process (detailed cost balance)**	3396141000
2	**Number of workers involved in the production process (human resources unit)**	453
3	**Annual average of worker wage (1÷2)**	7497000
4	**Number of actual production days per year**	255 days
5	**Worker's wage per day (3/4)**	29400
6	**Working hours per day**	7 hours
7	**Wage per hour (5÷6)**	4200
8	**Time required to produce a 60 A liquid battery**	2.5 hours
9	**Battery fee (7×8)**	10500

Table 7 shows that the factory only considered the direct material costs and wages for workers involved in the production process. It neglected all fixed costs (i.e., depreciation and other expenses). Fixed costs have been converted to the production system, which requires charging the order with its variable costs only, according to the opinion of cost department in the factory. A profit margin is added based on prevailing market prices or is lower than them by 10%-15%, in addition to calculating hours incorrectly. This will be addressed specifically in the proposed model for calculating the cost of salaries and wages for workers involved in the production process.

Cost analysis for liquid battery

Cost analysis for the liquid battery is carried out to determine the total cost of the standard battery after adding the costs that were not calculated by the factory. The cost elements were analyzed into (materials, wages, and indirect industrial costs) for comparison with the selling price to determine the real reasons for the significant increase in battery cost which leads to its exit from competition in local markets, as shown in Table 8:

Table 8 *Total cost of the standard liquid battery for Babylon factory 2 for the year 2021.*

	Details	Dinar/per battery	Toal amounts/dinars
	Raw and packaging materials	19200	
	Salaries and wages	10500	
	Initial cost	29700	69408900
	Indirect manufacturing costs	3757	
	Manfucturing cost (3+4)	33457	78189009
	Administrative and marketing costs	1650	
	Total cost (5+6)	35107	82045059
	Sale price 36000×2337	36000	84132000
	Profit	893	2086941

Table 8 above shows that the direct costs consist of expenses incurred on production departments for commodity and service supplies, including raw and packaging materials. As for indirect manufacturing costs, they include all costs spent on service departments, which are then distributed to production centers, including spare parts, fuel, marketing costs, and administrative costs to reach the total cost.

Therefore, the factory relies on the specific calculations mentioned above and excludes other calculations to achieve profitability. It should be noted that the Babylon factory 2 tried to exclude calculations from commodity and service supplies and other calculations to avoid potential losses and relied on these calculations to achieve profitability, as shown in the Table 8. Additionally, the product does not meet market and customer quality requirements, as it contains inputs that have environmental damage and effects in the internal environment of the factory, external environment, and users of this product. Costs can be reduced under the standard of converting resources to EEE, which will be addressed.

A- Standard indicators for producing one battery adopted by Babylon factory 2for the year 2021:

Table 9 *Standard indicators for producing the standard liquid acid battery*

Product	Fixed cost			Changeable cost			Manufcatruing cost
	Labor cost 1	Extinction 2	Other Materials	Raw materials 4	Spare parts 5	Fuel 6	
Liquid battery	10500	0	0	19200	1157	2600	33457

Table 10 *Standard indicators of total costs, selling price and industrial margin*

product	Fixed cost			Changeable cost			Selling price
	Measure unit 7	Manufacturing cost 8	Marketing costs 9	Administrative costs 10	Total costs 11	Industrial margin 10-11-12	
liquid battery	Number	33457	700	950	35107	893	36000

Table 10 shows that the standard indicators for producing one battery of all types depend on the preparation of the workers involved in the production process. They numbered 453 workers distributed among different departments and units in the factory. The total of salaries and wages for producing one battery amounted 10,500 dinars, without including the cost of depreciation and other expenses, making the total fixed costs 10,500 dinars.

It is a mistake for the factory to consider salaries and wages as part of the fixed costs because they are directly related to the workers involved in the production process and should be considered as changable costs. In addition, the changable costs of the battery were calculated to be 22,957 dinars, including raw materials for 19,200 dinars, spare parts for 1,157 dinars, and fuel expenses of 2,600 dinars. Shaping the total changable costs of the battery are 22957 Dinars and a manfucturing cost estimated 33457 Dinars.

Marketing costs were estimated at 700 dinars, while administrative costs were estimated at 950 dinars. It is evident that the industrial profit margin does not cover the costs, especially the fixed costs, which have increased and are not charged to the product but to the financial period in addition, there has been a decrease in production and sales ratios. This means that the profit does not cover the costs incurred by the factory. With at hand, the increase in changable costs due to wasting resources in the form of waste and not benefiting from them. However, these wastes cost the factory a lot to take them over. This adds another burden to production costs in the factory. Customers do not want to buy the company's products due to their high prices and inability to compete with other products. Based on these indicators, it is clear that the factory relies on approximate indicators without having a mechanism for calculating marketing and administrative costs, as shown in Table 11 for Babylon factory's 2 standard acid liquid battery production costs for 2021.

Table 11 *The costs of manufacturing 2337 standard acid-liquid batteries for the Babylon factory 2 for the year 2021*

Changeable costs					Manufcturing cost
Labor costs	Raw materials	Spare parts	Fuel costs	Total changeable costs	
=10500× 2337 24538500	=19200×2337 =44870400	=1157×2337	=2600×2337 =6076200	=22957×2337 2703909	=10500+22957 =33457×2337 78189009

Table 11 above dispalys the cost of a worker per year was 7,497,000 dinars and the number of workers involved in the production process was 453. The salaries and wages amounted to 3,396,141,000 dinars annually, while the cost of labor for one battery was 10,500 dinars. While they were considered fixed costs incurred by the factory annually, the salaries are grants received from the Ministry of Finance according to the budget laws in force. Other costs such as raw materials, packaging materials, spare parts, fuel expenses, etc. were changable costs in the production process, totaling 22,957 dinars per battery with a total cost of 53,650,509 dinars. The total production cost amounted 78,189,009 dinars. Marketing costs for one battery were 950 dinars, with a total marketing cost of 1,635,900 dinars. Furthermore, the marketing costs for one battery amounted to 950 dinars, so that the total costs incurred by the Babylon factory 2 are 2220150 dinar, and the total fixed, changable, marketing and administrative costs amounted to 35107 dinar per battery. So that the total costs are 35107 x 2337 = 82045059 dinars. The factory did not calculate fixed costs for the production process to overcome the high costs and its inability to cover the cost of manufacturing the battery.

A- Applying sustainability accounting standard

The Babylon factory 2 should manage its costs according to the standard of converting resources to EEE. To address the increase in costs, scenarios will be presented to reduce costs through the use of friendly environment and safe materials that do not cause harmful emissions and pollution to the internal and external environment of the factory and even to customers. The proposals can be clarified as follows:

Scenario 1: Relying on the actual need for employees in each production unit

After reviewing the field work of the Babylon factory 2, it was noticed that the number of involved workers in the production process is not proportional to the production quantity, resulting in waste of human resources and additional costs incurred by the factory. They are added to the cost of the product due to the unjustified increase in the number of workers, which is 453. Therefore, the number of workers in the production process should be reduced, which will lead to a reduction in the cost of the product, as suggested by the researcher. The factory will adopt the necessary working hours according to the following equations:

Battery production time x available power
2.5 hours x 87,500 = 218,750 hours annually

Actual total hours per day = daily working hours - attendance and departure time
= 8 - 1 = 7 hours per day

Actual total working days = number of days in the year - Fridays, Saturdays and public holidays
365 days - (52 weeks x 2) + 14 days = 247 actual days

Actual working hours per worker per year = Actual working hours per day x Actual total working days
7 hours x 247 days = 1729 hours

To calculate the standard number of workers according to the available energy, we will conclude the following:

The standard number of workers required for production = the time required for battery production ÷ total actual working hours per worker
=218750 ÷ 1729 hours = 127 workers

If the number of surplus workers according to the available power is 453 – 127 = 326 workers. This represents a reduction rate of approximately 72%. The factory needs 28% of the current workers in the production process. If we multiply this percentage by the salaries and wages of the workers in the production process, we will get the amount of reduction as follows:

Workers' salaries and wages of in the production process × reduction rate = 3396141000 × 72% = 2445221520 dinars, the amount of reduction in annual salaries and wages.

It is worth mentioning that 127 workers for the available power 87500 batteries do not mean that if all the batteries are produced according to the available power, but rather if 25000 batteries are produced, approximately 36 workers are needed. In addition, the factory calculates the labor cost at 10500 dinars per battery. The labor cost is shown in Table 12.

Table 12 *The difference between actual and reduced values according to available power*

No	Details	The actual reality of Babylon factory 2	After reduction according to the available power
1	**Salaries of workers involved in the production process (detailed cost balance)**	**3396141000**	**950919480**
2	**Number of workers involved in the production process (human resources unit)**	**453**	**127**

3	**Annual average of worker wage (1÷2)**	**7497000**	**7487554**
4	**Number of actual production days per year**	**255 days**	**247**
5	**Worker's wage per day (3/4)**	**29400**	**30314**
6	**Working hours per day**	**7 hours**	7 hours
7	**Wage per hour (5÷6)**	**4200**	**4331**
8	**Time required to produce a 60 A liquid battery**	**2.5 hours**	2.5 hours
9	**Battery fee (7×8)**	**10500**	**10828**

Table 12 displays that the reduction according to the production capacity will save 72% of salaries and wages, which amounts to 2445221520 dinars annually, in addition to a decrease in the actual production days from 255 to 247 days, a difference of 8 days, and a decrease in the number of workers in the production process compared to the actual number, as shown in the Figure 1 below:

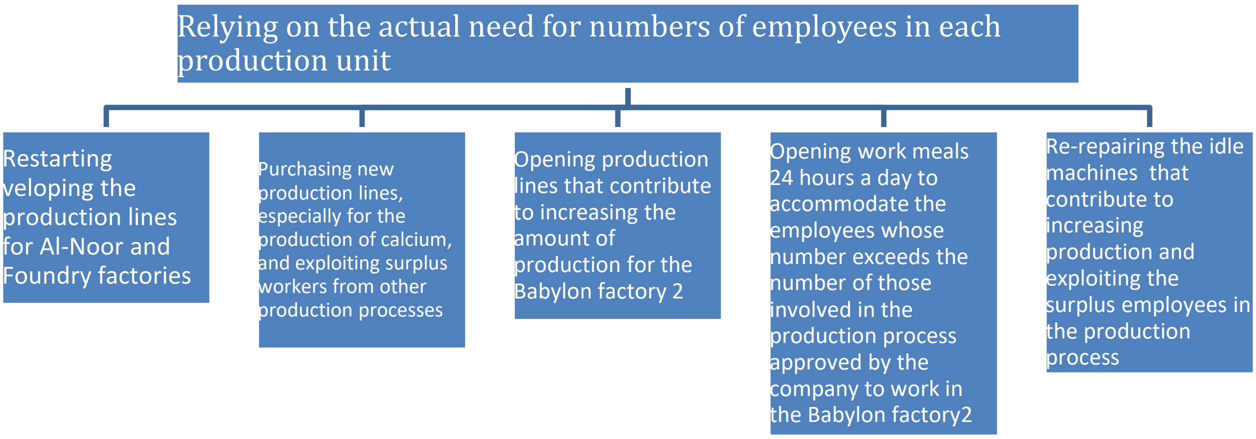

Figure 1. *The actual need for numbers of employees in the production process*

Scenario 2: Replacing calcium instead of (antimony - arsenic - tin - copper)
Through observation, investigation, and personal interviews with officials, engineers, and technicians in Babylon factory 2, it is clear that the lead ingot that is produced in the lead foundry factory does not need the four tensile materials described above. They can be replaced with calcium, which is at a price of 1.422$ + 8$ transportation expenses. That is, the equivalent of (9.422 x 1450) = 13662 dinars. This price is lower than the above materials as shown in Table 13.

Table 13 *The amount of cost reduction achieved*

Material	Quantity in kilograms	Cost in Iraqi dinar	Cost per productionvolume (2337)	Production cost if calcium is used
Antimony	0.151	5107	11935059	
Arsenic alloy	0.063	2431	5681247	
Tin	0.070	465	1086705	
Copper	0.040	931	2175747	
Total	0.323	8934	20878758	
Difference	41757516-73732.35=41683783.65			

Table 13 shows the process of replacing the resources (antimony, arsenic alloy, tin, copper) with calcium will result in a cost reduction of 41683783.65 dinars. Additionally, using tin, which was mentioned in the resource conversion standard for EEE as a conflict mineral that should be avoided or reduced in industries, indicates that this senerio will lead to cost reduction and achieve one of the main variables and proposed models for reducing costs and environmental risks.

Scenario 3: Using very pure lead and oxygen-vacuum containers to transport the plates produced in the lattice unit and the new casting molds produced in the oxide and ficus

After interviwing several engineers and technicians in the Babylon factory 2 regarding the above proposal, specialists confirmed that this proposal will make the battery less prone to damage and lighter in weight. The plates are subject to damage due to the type of lead used and oxidation of the plates when exposed to air. Furthermore, using the new molds will contribute to reducing the weight of the panels, improving the quality and effectiveness of the ficus dough, saving production costs and improving the quality of the battery, and seeking to reduce production and examination time by 15%, while production costs are reduced by 8% for production units and 12% for the final checkup units. Other activities related to materials will also see a cost reduction of 9%. Reducing the weight of the plates will significantly contribute to reducing costs and the amount of raw materials used. The weight of the battery will decrease, which will lead to a reduction in pressure on the plastic box, as shown in Table 14.

Table 14 *Cost of panels and reduced costs*

	Plate type	Plate cost pre reduction	Plate cose post reduction
1	Positive	6770	**338.5**
2	Negative	5891	**394.5**
Total		**12661**	633

Table 14 indicates that the costs of the positive panels will decrease by 338.5 dinars. In addition to the decrease in the costs of the negative panels by an amount of 394.5 dinars. Hence, the total costs of the panels will be reduced by 633 dinars, which indicates that the percentage of decrease in the costs of the positive and negative panels It will be (5%) of the total costs of the panels.

Table 15 *The decrease ratios in using pure lead and oxygen-vacuum containers*

no	Reduction type	Raduction ratio	Scenario usage verification	
			From	**To**
1	Reduction in battery production costs	8%	82045059 dinars	7548145.28 dinars
2	Reduction in material used in production	9%	22957 dinars	18595.17 dinars
3	Reducing check up time	12%	30 Sec	24 Sec
4	Reduing production time	15%	2.5 hr	2.125 hr

Table 15 shows that in the case of using very pure lead and oxygen-vacuumed containers, Babylon factory 2 will save 8% of the production costs, and a decrease in the materials used in production by (9%), in addition to a 12% decrease in the checkup time and 15% of the production time. This is what the research seeks to reduce costs, which is the main axis in this research. This can be calculated according to the following equations:

Battery cost = 82045059×92% = 7548145.28 dinars
Cost of materials in the production = 22957 × 91% = 18595.17 dinars
Checkup time = 30 × 88% =26.4 seconds
Battery production time = 2.5 hr x 85% =2.125 hr

Results can be drawn according to Table 16.

Table 16 *Summary of the results reached through the proposals*

Seneraio No	Reduction type	Before cost reduction	After cost reduction
First	The actual need for employee – Decreasing the number of employees – owering salaries and wages – educing the number of actual production days	454 3396141000 255	**127** **950919480** **247**
Second	Replacing the four tensile elements with calcium – owering cost of these minerals	41757516	**41683783.65**
Third	Using very pure lead and oxygen-vacuumed containers – educing production time by 15%. – ecreasing battery production costs by 8%. – educing checking up time by 12%. – educing the used preduction materials by 9% – educing the weight of the positive and negative plates	2.5 82045059 30 ثانية 12661	**2.125** **7548145.28** **30×88%=24** **Second** **7548145.28** **633**

Table 16 shows the the proposed findings indicating adhering to functional requirements will reduce salary and wage costs by 950919480 dinars and decrease the actual number of workers involved in the production process by 127 workers. Findings also show that actual working days will also be reduced by 8 days due to an incorrect calculation performed by Babylon factory 2.

Replacing the four (antimony, arsenic alloy, tin, copper) resources with calcium will also result in a cost reduction of 41683783.65 dinars. Using pure lead and oxygen-depleted containers will reduce production time by 15%, as well as production costs for the battery by 8% and checkup time by 12%. The amount of materials used will also decrease by 9%. Reducing the weight of the positive and negative plates will save costs by 633 dinars.

After explaining the scenarios and their associated costs, the resource conversion standard for EEE will be used to enhance these proposals and achieve the research goal. This includes improving product safety and performance, as well as managing the product life cycle and innovation to achieve environmental efficiency.

Product safety according to the standard for converting resources to EEE

The Babylon factory 2 can improve product safety performance through the following scenarios:

Firstly, replacing calcium instead the four tension elements used in battery production (antimony, arsenic alloy, tin, copper), as mentioned in the second scenrio.

Secondly, using very pure lead and oxygen-depleted containers to transport the produced plates in the new clamp and mold unit that produces oxide and lead paste, as mentioned in the third scenario above.

Managing the product life cycle and innovation to achieve environmental efficiency according to the standard for converting resources to EEE

Table 17. *Managing the product life cycle and innovation to achieve environmental efficiency*

Battery Type	sold quantity	Price	Earned revenue	Quantity for producing 2337 Standard Batteries ÷ Revenue
55 A	4	33000	132000	**2337÷86634000=0.0027%**
60 A	324	39000	12636000	
65 A	51	44000	2244000	
70 A	1	46000	46000	
72 A	57	49000	2793000	
90 A	124	55000	682000	
135 A	1365	82000	11193000	
150A	694	82000	56908000	
Total	2620	-	86634000	

Table 17 shows that the number of produced units are 2337 of standard acid liquid batteries, and the number of batteries sold during 2021 amounted to 2620 batteries at different prices depending on the battery size, the standard cost indicators prepared previously and referred to in this research. They determine the cost of the battery, including salary and wage costs, chanagable costs, marketing costs, and administrative costs. Table 17 indicates that the adopted scale achives that the percentage of products to revenue 0.0027%, indicating a low production-to-revenue ratio. This is a negative indicator that the Babylon factory 2 did not utilize available resources to achieve higher revenue and increased production volume. The researchers believe that relying on SAS, especially the standard for converting resources to EEE by the company for the purpose of cost reduction, and based on the information provided in the research, it is proven that the SAS for converting resources to EEE contributes to cost reduction.

CONCLUSIONS AND RECOMMENDATIONS

A- Conclusions

This section covers the most important conclusions reached by the researchers as follows:

1. The resource conversion to EEE standard will contribute to reducing product costs.
2. The SASs and EEE will provide information on how to manage materials, product safety, product life cycle management, and innovation to achieve environmental efficiency in producing friendly environmental products at low costs.
3. Relying on the actual need for employees in each production unit will contribute to reducing salary and wage costs.
4. Replacing the calcium material in production instead of the four tension elements used in battery production (antimony, arsenic, tin, and copper) will maintain product safety.
5. Using oxygen-free containers to transport the produced plates in the clamp and mold unit, which produces oxide and slag, will reduce production costs and improve battery quality.

Recommendations

After discussing the main conclusions in the current study, the researchers can provide some recommendations as a modest contribution to the Babylon factory 2 specifically and industrial companies in general for future benefit, as follows:

1. The Babylon factory 2 should adopt the resource conversion to EEE standard to reduce product costs.
2. The company should rely on the actual need for employees in each production unit to reduce high salaries and wages.

3. The company should adopt the resource conversion to EEE standard to help public companies, especially the General Company for Automotive and Equipment Industry, Battery Factory, to benefit from the information provided by the EEE equipment conversion standard.
4. Using calcium material in production instead of antimony, arsenic, tin, and copper to solve cost and environmental problems.
5. Using highly pure lead and oxygen-free containers to transport the produced plates to achieve environmental efficiency.

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