

PREPARING THE INCOME STATEMENT ACCORDING TO THROUGHPUT ACCOUNTING AND ITS IMPACT ON PERFORMANCE EVALUATION - AN APPLIED STUDY AT THE SOUTHERN REFINERIES COMPANY / BASRA REFINERY

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ABSTRACT

The goal of this study is to create an income statement using the Throughput accounting method and to determine the usefulness of this method in providing management with the essential information for performance evaluation. Throughput accounting is a cost accounting and management accounting technique that enables management to evaluate performance in light of contemporary production trends. Additionally, to determining the percentage of available energy that is being consumed. The South Refineries Company / Basra Refinery was subjected to the research as one of Iraq's industrial sector companies. The study followed a scientific methodology that incorporated both theory and practice. The study discovered a number of findings, the most significant of which is that the company did not make optimal use of available energy. This is due to a flaw in the implementation of plans and policies; because typical systems designed to operate efficiently result in a large amount of inventory, this has a negative effect on the business. It was concluded that throughput accounting is primarily concerned with sales as the sole source of (profit), as well as providing accurate and critical information about the most profitable product mix by rearranging products according to the completion rate for each minute the product consumes the limited resource during the manufacturing stages.

Keywords: Throughput Accounting, Performance Evaluation, Constraint Theory, Traditional Income Statement.

INTRODUCTION

Businesses have been forced to adapt their production processes and remain adaptive in order to maintain their profitability and viability as customer and market demands evolved (Lei & Li, 2017). As a result, it is necessary to seek out current ideas and methods for managing expenses and supplying information to evaluate performance. Throughput Accounting is a modern method that has emerged to meet management's requirements for implementing continuous improvement concepts, as it provides necessary information about the development of operational performance by focusing on bottleneck areas and reducing completion times, as well as attempting to link throughput and operational resources expended. It is a theory of constraints (TOC) tool for assessing operations prior to, during, and after they are executed (Goldratt; Cox, 1986), All other expenses (excluding direct materials) may be treated as fixed costs in Throughput accounting, and performance is evaluated using three primary metrics: revenue earned from sales (Throughput), unreported revenue exploited and frozen (inventory), and operating expenses.

Research Problem

Regardless of their operations, all businesses strive to improve their performance in order to be competitive in the market and keep up with developments. As a result, organizations are confronted with the inability of traditional cost systems to offer reliable cost information that aids in evaluating enterprise performance. As a result, the research problem is the following:

((How does the use of throughput accounting affect the accuracy of analyzing the enterprise's performance?)).

Research Objective

The goal of this study is to use the Throughput accounting approach as one of the cost and management accounting approaches that can be used to evaluate the facility's performance in light of current manufacturing trends, as well as to determine the value of using this approach in providing more accurate cost information that can be used to evaluate performance.

Research Importance

The significance of the study arises from the importance of accurately allocating expenses, particularly indirect costs, in a way that allows the facility to make the most use of its resources and reduce loss and waste percentages, Thus, improving areas of strength in the facility's performance in order to arrive at the most correct cost calculation and, as a result, an improvement in the process of setting the selling price and the related accurate performance evaluation.

LITERATURE REVIEW

Theory of Constraints

Eliyahu M. Goldratt coined the term "*constraints*" (Sanyuk & Sanyuk, 2010), which is now widely applied in environmental, production, resource, and risk management (Szatkowski, 2014). It is a business management tool that connects all manufacturing procedures and provides a practical approach that enables it to be used to solve problems of any size in order to emphasize the process of continuous improvement (Pozo, 2012:22), and management can assist in shortening the production cycle by stating that the flow rate of goods during the manufacturing process cannot be faster than These functions are expressed in the value chain, and one of the most critical roles of value chain management is to identify bottlenecks through the application of the theory of constraints, and that the performance of any process or event is dependent on the performance of the preceding event or process, implying that it is not possible to begin a new productive stage until the preceding event or process has completed (Groop, 2012:28).

Types of Constraint

Anything that keeps us from receiving more of what we want is referred to as a constraint. Every individual or facility faces at least one constraint (Noreen, 2011:15) which is distinct from a bottleneck, That happens throughout the manufacturing process , When the amount of work to be done outnumbers the amount of energy available (Horngren, 2012:686). There are two types of restrictions that establishments face:

Internal constraints: these are limitations on the firm's ability to meet demand for its products. They are classified as follows:

- a. **Production constraints:** This type of constraint, which includes machinery and equipment, staff, and any other tangible resources, is one of the most critical restraints placed on the manufacturing process. This limitation manifests itself when the constraint's outputs are unable to meet market requirements (Majercak & Majercakova, 2013:53).
- b. **Policy constraints:** These are the most challenging limitations to identify because they have a long-term, invisible effect and develop as a result of the facility's adoption of certain policies, such as adherence to a specific rule. Furthermore, these constraints impose a fixed rate of production, such as a no-overtime policy (Reid, 2010: 499).

External constraints: This category refers to a collection of restrictions imposed on the facility by external sources.

- a. **Supply constraints:** These are production constraints; the constraint may be caused by a scarcity of raw resources as a result of external factors, such as the existence of import limits on particular raw materials (Kershaw, 2000:4).
- b. **Demand constraints:** These are sales restrictions caused by an imbalance between the facility's production capacity and market demand for its products; in other words, this restriction occurs when market demand for the facility's products is less than the facility's production capacity, as the facility does not wish to accumulate inventory (Reid, 2010: 499).

Accounting for Throughput

Throughput accounting is a simplified method to managerial accounting that supports managers in making decisions with the purpose of increasing the profitability of the firm. This portal improves cost data, facilitating cost control and management rather than assigning process improvement tasks to workers (Lutlisky, 2018:1384), and is based on the principles of the theory of constraints, which focuses on managing the constraints imposed on a facility's operations and strives to provide all information required by the manager (Elsukova, 2015: 84). Maynard (2011: 36). Throughput Accounting is a management accounting technique that aims to maximize profits in resource-constrained environments. As a result, throughput accounting is a natural extension of the theory of constraints, as it is based on the management of bottlenecks and assists in measuring and determining the cost of sold and completed production, as well as seeking to improve achievement and reduce both inventory and operating expenses, and assisting management in making the best decision possible.

Numerous proponents of the throughput accounting technique have agreed on a set of implementation concepts, namely:

- a. **Throughput Margin:** This metric indicates the rate of inventory conversion to sales. Manufacturing a huge quantity of products and stocking them in stores is not considered throughput; nevertheless, inventories, and products or services, are deemed throughput only when they are sold to a client (Sproull & Nelson, 2016: 276). Calculate the throughput using the following formula:

$$\text{Throughput} = \text{selling price} - \text{direct material costs}$$
- b. **Inventory / Investment:** This concept refers to the money in the system that is used to convert inventory to throughput; it was previously referred to as simply inventory, but is now referred to as inventory or investment. This concept includes buildings, machines, and any other equipment used to manufacture items that the facilities intend to sell along with any knowledge imparted. Any of these investments, or a combination of them, may be deducted from your bank account (Sproull, 2016:276-277). It encompasses all of the Enterprise's investments, including the total production stock, the production in process stock, and the raw materials stock, among others. The stock is valued using throughput accounting, which takes only direct material costs into consideration.
- c. **Operating Expenses:** These are the expenditures incurred by the facility to maintain the current level of energy. They include fixed costs such as salaries, rent, depreciation, interest payments, and transportation costs (Zephro, 2009: 291).

The significance of throughput accounting in cost estimation and performance evaluation

With the raw material as the only variable, throughput accounting divides the structure of production expenses into components based on their behavior. The remaining components are grouped together as running expenses, which are set, long-term costs. And that the amount of inputs required to produce and sell each unit of the product must not exceed or fall below a predetermined level, as the product will not be completed if there is a shortage. If they are raised, they will be moved to warehouses, resulting in an increase in organization expenses due to retention, spoilage, and loss. The elimination of direct labor from the industrial cost structure is a result of significant changes in the modern production environment, which have resulted in an increase in machinery and equipment investments. When direct labor costs are classified as fixed costs, raw material costs become the only variable component of costs (Cox III & Boyed, 2020:150). It rapidly and readily establishes the facility's strengths and weaknesses (Zheng & Abu, 2019:12). As a result, the approach to achievement accounting is predominantly based on the time component, which is referred to as Throughput Time. Throughput Time reflects the time required to convert one unit of a product from conception to completion and delivery to the client (Anderson, 2009:1-2). The term "*Throughput Time*" refers to four distinct components (Garrison et al., 2011:471):

1. Processing time: This is the time required for the product to be manufactured.
2. Inspection time: the length of time necessary to ensure the safety of the product.
3. Moving time: The time required for materials and auxiliary parts to move from one stage of the manufacturing process to the next until the finished product is completed.
4. Waiting time: The time required to operate, examine, or charge a product.

Decreased throughput time has a number of benefits, including cost savings in production and storage, reduction of indirect industrial costs connected with material transportation, reduction of the risk of obsolescence, as well as faster customer response and shorter delivery periods (Zimmerman, 2011: 639).

The term "*throughput accounting*" refers to a variety of performance indicators, with performance referring to the process of evaluating current and historical performance against pre-determined standards and comparing performance to those standards in order to identify performance gaps and formulate necessary corrective actions and feedback in order to identify the evaluation's results and assimilate them (Dessler, 2014:216). After reviewing what has been accomplished in accordance with work standards and through evaluation, criteria for evaluating financial performance against the reality of the company's strategic plans and objectives are established. These criteria are based on performance evaluation strategies that serve as a driver and monitor for the efforts of employees at all administrative levels in order to accomplish the strategic objectives (Poister, 2005: 46). Performance evaluation is the process of testing or analyzing a certain piece or system under specified conditions. Efficiency and effectiveness are critical indicators of a facility's performance and the identification of its strengths and deficiencies. As a result, performance measures based on constraints theory are classified as follows (Kadhim et al., 2020:766):

1. Enterprise-level performance indicators such as net profit, return on invested capital, and cash flow.
2. Internal performance indicators such as internal operations surplus, which is defined as sales revenue minus direct material and inventory expenditures. This figure denotes the amount of money spent by the business on the acquisition of materials and assets. Additionally, these figures include operating expenses, which are the dollars paid by facilities to convert inventory into surplus for internal use.
3. Metrics for process performance based on comprehensive cost data.
4. Constraints are concerned with short-term outcomes and overlook the long-term vision that strategic decisions require.

5. When it comes to allocating expenses to units generated, time is the most critical aspect in the approach of achievement accounting. Lead time refers to the time required to transform raw materials into a finished product and sell it.

METHODOLOGY OF RESEARCH

An overview of the South Refineries Company (the Basra Refinery)

South Refineries Firm is a publicly traded company with its headquarters in the Basra Governorate, Zubair District, and Shuaiba. It is one of the country's largest transformative firms, creating oil derivatives utilizing the most advanced scientific and technological procedures, ensuring goods of similar quality to imported products while meeting customer criteria. Basra Division 1/, Basra Division/2, and Basra Division 3 are the refinery's three production lines. Each part is capable of producing 70,000 barrels per day. The company's primary business is refining crude oil and manufacturing several types of oil derivatives, including light oils, gasoline, diesel fuel, liquid gas, jet fuel, and premium gasoline. Additionally, the company produces heavy oils including Babel oil, diesel oil, and asphalt.

The company's manufacturing system

The firm use the production Process system to manage the manufacturing of its various key products. The steps of production in the South Refineries are as follows:

The initial stage (distillation or separation) consists of the following: At this point, crude oil is injected into the refining unit and decomposes into a variety of products, including final goods (light oil, jet fuel, fuel oil, gasoline) and intermediate products (liquid gas, light naphtha, heavy naphtha) that are used to make other products.

The second stage is as follows (splitting or upgrading gasoline): The first stage's heavy naphtha is processed into a range of products, including reformat, which is used to make premium gasoline, and hydrogen, which is utilized in the fat section and the liquid gas product.

The third step, referred to as the treatment stage, is as follows: The liquid gas created at this step enters the distillation stage, and the liquid gas produced during the gasoline improvement stage is processed to become the final liquid gas.

Fourth stage (blending stage): This stage combines the fuel created during the gasoline refinement process, the light naphtha produced during the distillation process, and imported gasoline to create the premium gasoline product.

Throughput accounting in practice at the Basra Refinery Company

The use of this concept's fundamental assumptions is necessary for determining the cost structure of products, as well as the time required to complete each product in the stages through which it goes, in order to apply the processes of accounting for achievement. These assumptions will be monitored throughout the cost structure, constraint determination, and time management processes as follows:

To begin, the cost structure of the products is determined using throughput accounting:

1. **Variable costs:** Because they are the only variable element, they are the only variable costs under the usage of Throughput accounting.
2. **Operating expenses:** These are fixed expenditures that are allocated to the period in which they were incurred regardless of production volume. Indirect materials, direct and indirect salaries, and indirect industrial costs are also included.

Second: determining production costs based on Basra oil refinery records as follows:

- 1- According to statistics derived from the Cost and Budget Division, total production expenses in the South Refineries Company / Basra Oil Refinery were 981,411,108,529 ID in Table 1:

#	Details	Cost(ID)
1	Raw Materials	793,080,919,862
2	Operating	188,330,188,667
3	Total Costs	981,411,108,529

- 2- **For each product**, the production quantities, sales, and selling prices for the year 2018 were computed as given in Table 2.

#	Products	Production Quantity /m3	Sales Quantity/m3	Sales Price/ID
1	Light oil	748,178	396,443	135,000
2	Gasoline	1,596,843	1,754,475	135,000
3	fuel oil	5,293,294	5,469,859	60,000
4	Liquid Gas/ ton	122,200	117,700	70,000
5	Petrol	3,539,640	1,824,130	160,000
6	Jet Oil	29,350	16,401	175,000

- 3- **Calculating the price of one cubic meter of each product:** In this phase, the entire cost of raw materials, production costs, and administrative services costs are added together to calculate the cost of producing a cubic meter for each product, as shown in the Table 3 below:

#	Products	Raw materials cost for 1m3	Production cost for 1m3	Administration cost for 1m3	Total cost for 1m3
1	Light oil	49,018	15,699	2,463	67,180
2	Gasoline	41,340	13,240	2,077	56,657
3	fuel oil	17,321	5,547	870	23,739
4	Liquid Gas/ ton	286,778	79,913	14,782	381,473
5	Petrol	84,342	449	76	84,867
6	Jet Oil	49,982	16,008	2,511	68,501

- 4- **Preparing the traditional income statement for each product:** For the year 2018, the income statement will be prepared using the traditional method used in the company on the basis of products for research purposes, whereas the income statement in the Basra Refinery Company is prepared on the basis of total sales, , so it will be calculated using the amount of sales and selling prices as well as the cost of one cubic meter of total costs Production and administrative services, as shown in Table 4 below:

Table 4
THE TRADITIONAL INCOME STATEMENT FOR EACH PRODUCT BASED ON THE BASRA REFINERY SYSTEM

#	Products	Sales revenue	Production Cost	Margin profit	Administrative service cost	Net profit
1	Light oil	53,519,805,000	(25,656,601,631)	27,863,203,369	(976,439,109)	26,886,764,260
2	Gasoline	236,854,125,000	(95,759,245,500)	141,094,879,500	3,644,044,575))	137,450,834,925
3	fuel oil	328,191,540,000	(125,084,735,612)	203,106,804,388	(4,758,777,330)	198,348,027,058
4	Liquid Gas	8,239,000,000	(43,159,530,700)	(34,920,530,700)	(1,739,841,400)	(36,660,372,100)
5	Petrol	291,860,800,000	(154,669,806,830)	137,190,993,170	(138,633,880)	137,052,359,290
6	Jet Oil	2,870,175,000	(1,082,301,990)	1,787,873,010	(138,633,880)	1,746,690,099
TOTAL		921,535,445,000	(445,412,222,263)	476,123,222,737	(11,298,919,205)	464,824,303,532

Note: Income statement as horizontal Line for typing and organizing reasons

- Sales revenue = sales quantity (table 2) * Sales Price (Table2)
= 396,443 m3 * ID135, 000 = ID 53,519,805,000
- Production Cost = Sales Quantity * Total of production cost for 1m3
= Sales Quantity * { Admin.cost (table 3) + Production Cost (Table3)}
= 396,443 * (49,018 + 15,699) = ID 25,656,601,631
- Margin Profit = Sales Revenue - Production Cost
= 53,519,805,000 - 25,656,601,631 = ID 27,863,203,369
- Admin. Cost = Sales quantity (Table 2) * Admin. Cost for 1m3
= 396,443 * 2,463 = ID 976,439,109
- Net Profit = Margin Profit – Admin. Cost
= 27,863,203,369 - 976,439,109 = ID 26,886,764,260

Constraints Determining

The time it takes for each product in the production Process to reach the stage where it becomes fully manufactured, which can be identified in the next step of the application of the Throughput accounting, is used to determine the production process's obstacles.

Time Management

The research findings were chosen based on the daily transfer, so the available time is 1440 minutes per day, measured by 24 hours x 60 minutes, when the shift system is divided into three groups of workers divided on one day at a rate of (8 hours) for each worker. The products pass through four stages, beginning with the distillation stage, which is the most basic, followed by the stage of improving the gasoline, the treatment stage, and the mixing stage. Some products are finished during the first stage, while others must go through additional stages to be fully manufactured. As a result of the unstructured interviews with the engineers in the production department, it was discovered that the stage of improving gasoline is the choking point, as it takes an additional (20 minutes) per day (1460-1440 minutes) to complete the production of liquid gas and gasoline, as shown in Table 5.

Table 5
THE TIME REQUIRED TO PRODUCE EACH PRODUCT

#	Products	Stapes/Minute				Total Time
		Distillation	Gasoline Improvement	Processing	Blending	
1	Light oil	840	-	-	-	840
2	Jet Oil	600	-	-	-	600

3	Gasoline	930	-	-	-	930
4	Fuel Gas	1020	-	-	-	1020
5	Liquid gas	300	800	180	-	1280
6	Petrol	720	660	-	60	1440
	Total	1020	1460	180	60	

Looking at the company's practical reality, it was discovered that the time calculated in the distillation stage is (1020 minutes) when all products are done at the same time, but the time taken for each product in this stage varies from one product to the next.

Creating an income statement using Throughput Accounting

To prepare an income statement using Throughput accounting, the operating expenses must be distributed based on the time of completion, depending on the amount of sales and the selling price:

Calculating the value of Throughput time

The value of Throughput time must be known in order to extract the share of each product from the operating expenses, as shown in Table 6 below:

#	Product	Sales Quantity/m3	Sales Price/ID	Operating Time/second	Value of Throughput time ³
1	Light oil	396,443	135,000	0.00112	59,942,182
2	Gasoline	1,754,475	135,000	0.00058	137,375,393
3	Fuel Oil	5,469,859	60,000	0.00019	62,356,393
4	Liquid Gas	117,700	70,000	0.01047	86,262,330
5	Petrol	1,824,130	160,000	0.00041	119,662,928
6	Jet fuel	16,401	175,000	0.02044	58,666,377
Total					524,265,603

The operating time for each of the products listed in Table (6) was calculated using the following equation (using Light oil as a sample):

- Operating time = Total product time (Table 5) / Production quantity (Table 2.)
= 840 Minute / 748,178 m3 = 0.00112 Minute/ m3
- Throughput time value = sales quantity (table 2) * selling price (table 2) * time spent in operation = 396,443 * 135,000 * 0.00112 = ID 59,942,182

Determining the product's share of the value of Throughput time

The product's share of the value of Throughput time = the value of the product completion time (Table 6) / the total value of the time of Throughput of the products (Table 6) x 100 = 59,942,182 / 524,265,603 * 100 = %11.4 throughput time value

The Table 7 below shows the percentage of each product based on the value of throughput time.

#	Products	Throughput time value	Product share from throughput time value
1	Whit oil	11.4%	59,942,182
2	Gasoline	26.2%	137,375,393

3	Fuel Oil	11.9%	62,356,393
4	Liquid Gas	16.5%	86,262,330
5	Petrol	22.8%	119,662,928
6	Jet Fuel	11.2%	58,666,377
	Total	100%	524,265,603

Calculate the Product's Percentage of Total Operating Expenses

Using Tables (1) and (7), the share of each product in operating expenses can be calculated as follows (using Whit oil as an example):

The product's share of the total operating expenses = the total operating expenses (Table 1) * product's share of the Throughput time value (Table 7).

$$= 188,330,188,667 * \%11.4 = \text{ID } 21,469,641,508$$

#	Product	Percentage	Product share from operating exp
1	Whit oil	% 11.4	21,469,641,508
2	Gasoline	%26.2	49,342,509,431
3	Fuel Oil	% 11.9	22,411,292,451
4	Liquid Gas	% 16.5	31,074,481,130
5	Petrol	%22.8	42,939,283,016
6	Jet Fuel	% 11.2	21,092,981,131
	Total	100%	188,330,188,667

Creating an income statement using the Throughput accounting approach, based on the results of calculating and determining the share of each product in operating expenses.

#	Products	Sales revenue	Raw materials Cost	Margin profit	Production cost	Net profit
1	Light oil	53,519,805,000	(19,432,842,974)	34,086,962,026	21,469,641,508))	12,617,320,518
2	Gasoline	236,854,125,000	72,529,996,500))	164,324,128,500	49,342,509,431))	114,981,619,069
3	fuel oil	328,191,540,000	(94,743,427,739)	233,448,112,261	22,411,292,451))	211,036,819,810
4	Liquid Gas	8,239,000,000	(33,753,770,600)	(25,514,770,600)	(31,074,481,130)	56,589,251,730))
5	Petrol	291,860,800,000	(153,850,772,460)	138,010,027,540	(42,939,283,016)	95,070,744,524
6	Jet Oil	2,870,175,000	(819,754,782)	2,050,420,218	21,092,981,131))	19,042,560,913))
	TOTAL	921,535,445,000	(375,130,565,055)	546,404,879,945	188,330,188,667	358,074,691,278

The raw material costs and throughput margins in Table (9) were calculated using the following equations (Light oil as a sample):

- Raw Material costs = sales quantity (Table 2) x the cost of one m3 of raw materials (Table 3) = 396,443 * 49,018 = ID 19,432,842,974
- Throughput Margin = Revenue - Raw Material Costs
= 53,519,805,000 - 19,432,842,974 = ID 34,086,962,026

CONCLUSION

We observe that the costs of some products are higher than they were in the traditional system, owing to the different bases for allocating costs, where in the traditional system the allocation of costs is based on the quantity of production, whereas in throughput accounting the allocation is based on the amount of sales. The traditional system's distribution bases may be misleading in terms of product unit cost, whereas Throughput accounting focuses on time as a basis for distributing operating expenses. As a result, the company's activity yielded a profit of according to Throughput accounting (ID

358,074,691,278), while the activity resulted in a profit of (ID 464,824,303,532) according to the traditional income statement, this decrease in profit is due to the high costs charged to the products according to Throughput accounting. In the traditional system, product inventory is charged with both direct materials and direct wages, as well as indirect industrial costs. This results in a decrease in costs charged to sales, which leads to an increase in profits, while inventory is charged with the cost of raw materials in accounting for completion (direct materials). Sales are only charged for direct wages and indirect industrial overheads.

We also noticed that the outcome of each product's activity ranged from high to low, as a result of the activity of fuel oil, profit increased by (ID 211,036,819,810) over what it was under the traditional system (ID 198,348,027,058), while the result of other products' activity decreased from what it was under the traditional system. Looking at the income statement, it is clear that the company's throughput of some products, specifically liquid gas and jet fuel, does not cover its operating expenses. As a result, the company should strive to increase Throughput by increasing sales.

Distributing costs to products in pre-determined proportions based on samples is an incorrect procedure because it misleads the cost of the unit produced, as a product is charged with more or less than necessary, weakening the company's cost accuracy. As a result, the company should strive to increase Throughput by increasing sales.

Distributing costs to products in pre-determined proportions based on samples is an incorrect procedure because it misleads the cost of the unit produced, as a product is charged with more or less than necessary, weakening the company's cost accuracy. The use of a single basis, time spent in operation according to Throughput accounting, provides accuracy and fairness in cost distribution to products.

The study recommends using the Throughput accounting approach because it provides better measures and accurate information for planning, administrative decision-making, and its role in more accurately measuring and evaluating performance. In addition, the cost structure classification should be reconsidered in light of the modern manufacturing environment and in accordance with the Throughput accounting approach.

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