

# MODULE 13

## **ACCOUNTING FOR REFINING AND PETROCHEMICAL OPERATION**

# OUTLINES

- Introduction
- Petroleum Refining Processes
- Accounting For Refining Operations

# Introduction

Operation in the oil and gas Industry are specifically divided into two namely. Upstream and downstream. Refining and petrochemical production are therefore part of the downstream. Downstream activities involve all activities ranging from transporting crude oil to the refinery; the refining operations and marketing where finished petroleum products are sent to the final consumers.

# Petroleum Refining Processes

Petroleum refining is defined as a means of producing fuel, lubricant, greases and road surfacing materials with the emphases on fuels. Basically, it involves vaporizing crude oil by heating it to a high temperature collecting the resulting gases and condensing them back to a liquid state refining are carried out in different unit of processing. These processes are;

- a) Primary processes or physical separation process (i.e crude oil distillation)
- b) Secondary or conversion process
- c) Treating process
- d) Blending process.

## **Petrol Chemical**

This is a chemical substance produced commercially from feedstock derived from crude oil or natural gas. Petro chemical plants are usually integral parts of large refining complexes and often subsidiaries of major oil companies. Their function is to turn outputs of the refining process either in form of crude oil fractions or their cracked or processed derivatives into feedstock that will ultimately be used in the manufacturing of a host of other product e.g plastics and detergents

# Petroleum Refining Processes Cont....

## Classification of Petrochemicals

The three main classes are;

- a) Aliphatic compounds
- b) Aromatic compounds
- c) Inorganic compounds

## Typical Petrochemical Manufacturing Processes

Typical petrol chemical manufacturing processes include;

- a) Ammonia synthesis
- b) Polyethylene production
- c) Phthalic anhydride production
- d) Sulphur recovery.

## Typical Petrochemical Plant Unit

These are divided into two units namely;

- **Olefin units:** the primary job of olefin units is to provide ethylene and propylene for use in polymer units
- **Polymer units:** in this unit propylene and ethylene are combined into larger molecules to make polypropylene and polyethylene

# Accounting for Refining Operations

Refining activities involve transportation of crude oil to the refining plant, processing and marketing of refined products. It also involves an enhancement of refinery plant or machines for an effective and efficient performance. The treatment involved of the cost incurred are classified below;

## **a. Basis Of Capitalization**

- i. Costs incurred in improving performance of refining plants or machines are capitalized
- ii. Cost incurred in improving the revenue base of the refined product is expensed with

## **b. Crude Oil Purchasing and Exchanges**

- i. Exchange of crude oil between refining company due to mismatch, should be recorded in a temporary memorandum books
- ii. Crude oil purchase are recorded as cost of sales
- iii. Sales of crude oil are recorded as income

## **c. Transfer Pricing**

Since a refinery is an integral part of a whole company, it follows that there could be inter-departmental transfer of crude oil. Therefore, the determination is in respect of;

# Accounting for Refining Operations Cont....

- i. Transfer price of crude oil from upstream division of the company or subsidiaries of the company and;
- ii. Transfer price of gasoline and other product of the refinery.

## **d. Processing of Crude Oil Belonging to Outsiders**

Where the refinery receives crude oil belonging to third parties for processing , only memorandum books are to be kept to control the quantity, The consolidation received in form of processing feeds should however be treated as a deduction from operating costs.

## **e. Cost of Catalysts**

- i. Cost of acquisition of costly catalysts in refinery should be capitalized
- ii. The cost of processing and replenishing the catalysts should be expensed with

## **f. Cost of Periodic Turnover Maintenance**

Cost incurred in the periodic maintenance of the refinery are initially capitalized. A provision for turn around costs is then made by a monthly charge to operating expense.

## **g. Depreciation**

This is calculated on straight line basis for the entire plants. Total depreciation is then allocated to production and other units on the basis of investment in the units.

# Accounting for Refining Operations Cont....

## **h. Standby Equipment**

These are equipment bought and kept for replacement purpose. They are spare parts stored for use when the need arises.

## **i. Inventory Valuation**

Inventory is valued at lower of cost or net realizable value. Unrealized profit must be eliminated

## **j. Sale of Refined Products**

Sales of refined products include transfers to other division at appropriate transfer prices and sales to outsider.

## **Accumulation and Classification of Costs**

Costs are classified by object or functions. Costs classified by object based on the object of cost in itself e.g. wages, salaries, transportation etc. While costs classified functionally are based on areas of managerial responsibilities, excepts cost of crude oil that charge to purchases and eventually transfer to manufacturing account as cost of production.

## **Allocation of Costs**

Total production cost must be determined and spread over unit produced in order to determine unit product costs and sale prices. Cost of service units must be spread over production units before unit product costs are determined.



# Accounting for Refining Operations Cont....

## **Service department cost allocation**

We have three method of allocating service department cost to production costs and thereafter to production costs and thereafter to production units. They are as follows;

- i. Direct method
- ii. Step method
- iii. Simultaneous method.

## **Illustration**

The following data were extracted from the cost records of Adeogo petroleum company for the month of December 2015

## Accounting for Refining Operations Cont....

Department	Original Cost ₦	% of service rendered		
		Maint	Power	Steam
<u>Receiving Services</u>				
Distillation	1,000,000	40	20	35
Cracking	300,000	15	25	20
Treatment	240,000	20	30	10
Maintenance	160,000	-	10	20
Power	80,000	15	-	15
Steam	<u>20,000</u>	<u>10</u>	<u>15</u>	<u>-</u>
	<u>1,800,000</u>	<u>100%</u>	<u>100%</u>	<u>100%</u>

You are required to allocate the service department costs over the producing department of Adeogo petroleum company using

- a. Direct method.
- b. Step method

(Assuming no other costs are incurred)

# Accounting for Refining Operations Cont....

## Solution

a. Direct method

	<u>Distillation</u>	<u>Cracking</u>	<u>Treatment</u>	<u>Total</u>
Direct costs	1,000,000	300,000	240,000	1,540,000
Allocation of costs;				
Maintenance	67,368	33,684	58,948	140,000
Power	20,000	33,333	26,667	80,000
Steam	6,667	10,000	3,333	20,000

# Accounting for Refining Operations Cont....

## b. Allocation of costs using step method

	Maintenance	Power	Steam	Distillation	Cracking	Treatment
Direct cost	160,000	80,000	20,000	1,000,000	300,000	240,000
Allocation of costs;						
Maintenance	( 160,000 )	24,000	16,000	64,000	24,000	32,000
Power		(104,000)	17,337	23,109	28,891	34,663
steam			(53,337)	<u>28,772</u>	<u>16,412</u>	<u>8,203</u>
				<u>115,831</u>	<u>69,303</u>	<u>74,866</u>

## Allocation of Cost to Joint Product

Costs are also allocated to joint product. The method available for this are;

- i. Physical method and
- ii. Market method

# Accounting for Refining Operations Cont....

## i. Physical Method

The method uses API gravity which is a measure of products weight

$$\text{API} = \frac{141.5}{\text{Specific gravity (in grams)}} - 131.5$$

**Note;** specific gravity is the weight of an object in relation to one gram of water. The formular is;

$$\frac{\text{Total Barrel Gravity of Production in Inventory}}{\text{Total Barrel of Gravity of Total Production}} \times \text{Total Cost of Production}$$

## ii. Market Method

This method allocates total joint costs to joint product based on their relative market values at the split-off point

### Relative Sale Value Method

This method apportions in pro portion to either sales values or the net realizable values of the product

# Accounting for Refining Operations Cont....

## **Other Methods**

Others methods of allocating joint costs are;

- a. The replacement costs method
- b. The alternative use method ,and
- c. The bye-product method.

## **Accounting for Petrochemical Activities**

Accounting for petrochemical operations are done in the same way as that of refinery operation. Petrochemical operation can be done on its own or joint administration and others services.

# References

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