ARBAMINCH UNIVERSITY

COLLEGE OF BUSINESS & ECONOMICS

DEPARTMENT OF ACCOUNTING & FINANCE

Cost and Management Accounting I (AcFn 2091)

FOR

DISTANCE EDUCATION PROGRAM

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Acknowledgement

First and foremost, I would like to express my deepest thanks and gratitude to writers of books and reference materials from which this module is compiled. A special word of mouth is their credit. I also appreciate editor, Ato Yitay Elema and Ato Tolosa Negese for originally preparing this module and all of my colleagues for their valuable constructive comments, suggestions and assistance. Last but not least, I highly thank Negalign Mamo (Msc), me, for revising of this material.

PREFACE

Cost accountancy has the reputation of being hard to learn and hard to teach. It is so probably because it is a highly specialized subject requiring an in depth understanding of its complex concepts and techniques. This module is an attempt to alleviate this problem by providing the students with thorough grounding in cost concept, cost behavior, costing methods and techniques and with an understanding of the uses and limitation of cost data for planning and control process.

The module has been divided into seven chapters in a systematic manner from 'the concept of management' to 'joint products and by- products' with adequate emphasis on all important aspects of cost accounting. On the whole, our approach has been simple, easy to understand and full of illustration including diagrammatic presentation. We hope our understanding of the subject and teaching experience is well reflected in a systematic presentation of the subject. The subject matter has been organized on 'first things first' and to sustain the students' interest.

Questions and problems given in the modules have been thus selected based on information disclosed in the module. Quite a good number of typical problems have also been worked out in each chapter. Moreover, objective type questions like true or false statements, fill in the blanks, etc have been given under the heading self-test questions.

On the whole, I feel that this material would prove to be useful to both the students and teachers of the subject in various universities.

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CHAPTER ONE

Introduction to Cost and Management Accounting

Learning objectives:

After reading this chapter you should be able to:

Up on completion of this learning task, students will be able to:

- Out line and distinguish the role of cost accountant, management accountant and financial accounting in the organization.
- Explain cost terminology and classification
- Use the cost- volume-profit techniques for decision making
- Prepare master budget
- Prepare flexible budget and conduct variance analysis
- Apply Relevant Information for decisions in value chain

1.1 Introduction

Cost Accounting

Cost is an amount that has to be paid or given up in order to acquire goods or services. In business, cost is usually a monetary valuation of effort, material, resources, risks incurred, and opportunity forgone in production and delivery of a good or service.

Accounting is the process of identifying, measuring, recording and communicating financial information to interested users so that they can make the best possible decisions. Thus, cost accounting is the process of identifying, measuring, recording and communicating cost information which will be used for determination of cost of a products or services on the basis of historical data. This was the emphasis of cost of accounting for many years, however in the course of time, the determination of cost of product or service has become equally important with cost control due to competitive nature of the market and because of technological

developments in all areas. Thus, now a day's cost control and reduction has also come within the scope of cost accounting.

Modern cost accounting is, thus, concerned with recording, classifying and reporting cost information for:

- Determination of costs of products or services,
- Planning, controlling and reducing costs and
- Furnishing of information to management for decision making.

Definitions

According to T. Horngren "Cost accounting measures and reports financial and other information related to the acquisition or consumption of an organization's resources. Cost accounting provides information to both management accounting and financial accounting.

The Chartered Institute of Management Accountants (CIMA) defines it as," The establishment of budgets, standard costs and actual cost of operations, processes, activities or products and the analysis of variances, profitability or the social use of funds".

Wilmot has summarized the nature of cost accounting as, "the analyzing, recording, standardizing, forecasting, comparing, reporting and recommending" and the role of cost accountant as that of "a historian, news agent and prophet". As a historian he must be meticulously accurate and sedulously impartial. As a newsagent be must be up to date, selective and pithy. As a prophet he must combine" knowledge and experience with foresight and courage".

Role of Cost Accounting in Decision Making

Many factors are considered while fixing the price of a product/item such as competitors' price etc. One of the basic factors is the cost of its production. Cost is essential not only to fix price but also to ascertain the margin of profit.

Knowledge of the cost determination is also necessary to keep a check on the cost of product/control on wastages, etc. The accounting used to study the various aspects of cost is known as cost accounting.

The main areas of decision making where cost accounting is very much helpful can be summarized as follows:

- Ascertaining product unit cost

- Controlling cost
- Stimulating cost consciousness
- Determining selling price
- Determining profit and loss for various products and services and inventory valuation and
- Providing basis for formulating operating policies.

Management accounting

Management accounting is the process of identification, measurement, accumulation, analysis, preparation, interpretation, and communication of financial (and non financial) information used by management to plan, evaluate, and control the organization and to assure appropriate use and accountability for its resources. The management accountant is expected to provide timely, accurate information including budgets, standard costs, and variance analyzes, support for so that planning, organizing, directing and controlling of business operations can be done in an orderly manner.

Management accounting information helps organization make better decisions. Such decisions make all organizations become more cost effective and help manufacturing, retail and service organizations becomes more profitable. The major objectives of managerial accounting activity are:

- Providing managers with information for decision making and planning
- Assisting managers in directing and controlling operational activities
- Motivating managers and other employees toward the organizational goals
- Measuring the performance of subunits, managers and other employees with in the organization.

Managerial accountants supply all kinds of information to management and act as strategic business partners in support of management's role in decision making and managing the organization's activities. Measuring managing and continuously improving operational activities is critical to be organization's success.

Management accounting provides valuable services to management in all of its function as summarized below:

Planning: Management accounting makes an important contribution in performance of the planning function. It makes available the relevant data after pruning and analyzing them suitably for effective planning and decision-making.

Controlling: It involves evaluation of performance keeping in view that the actual performance coincides with the planned one and remedial measures are taken in the event of variation between the two.

Coordinating: It involves interlinking of different divisions of the business enterprise in a way so as to achieve the objectives of the organization as a whole.

Organizing: A sound system of internal control and internal audit for each of the cost or profit centers helps in organizing and establishment of a sound business structure.

Motivating: It involves maintenance of a high degree of morale in the organization. The superiors should be in a position to find out whom to demote or promote and to reward or penalize.

Communicating: Communicating involves transmission of data, results etc. both to the insiders as well as outsiders. The management owes a duty to the creditors, prospective investors, shareholders etc to communicate to them about the progress, financial position etc of the enterprise. Management accounting helps the management in performance of their function by developing a suitable system of reporting.

Management Accounting Guidelines

Three important guidelines help management accountants provide the most value in performing their functions. They are: -

- Cost-benefit approach
- Behavioral and technical considerations and
- Different costs for different purposes.

Cost benefit approach: Management accountants continually face resource allocation decisions. A cost benefit approach should be used in these decisions-resources should be spent if they promote decision making that better attains organizational goals in relation to the costs of those resources. The expected benefits from spending those resources should exceed their expected costs.

Behavioral and Technical considerations: A management accounting system should have two simultaneous missions for providing information:

- To help managers make wise economic decisions, and
- To motivate managers and other employees to aim and strive for goals of the organization.

Both accountants and managers should always remember that management system are not confined exclusively to technical matters such as the type of computer software systems used and the frequency with which reports are prepared. Management is primarily a human activity that focus on how to help individuals do their jobs better. For example it is often better for managers to personally discuss how to improve performance with underperforming workers rather than just sending these workers a report highlighting their underperformance.

Different costs for different purposes. The different costs for different purposes theme is the management accountant's version of the "one shoe does not fit all size" nation. A cost concept used for the external reporting purpose may not be an appropriate concept for internal routine reporting to managers. Consider the advertising costs associated with launching a major new product. For external reporting to shareholders, television-advertising costs are fully expensed in the income statement in the year they are incurred. In contrast, for evaluating management performance (internal reporting purpose), the television advertisement costs could be capitalized and then written off as expenses one several years. There are multiple external parties and multiple internal parties for which financial reports are prepared. Any specific accounting method is unlikely to be the preferred method for all external parties or all internal parties. Indeed, even an individual manager may prefer accounting method A for one decision and accounting method B for another decision.

Cost accounting and Management accounting

Cost accounting refers to the accounting procedures relating to recording of all incomes and expenditure and the preparation of periodical statements and reports with the object of ascertaining and controlling costs. It is thus the formal mechanism by means of which the cost of products or services are ascertained and controlled.

On the other hand Management accounting involves collecting, analyzing, interpreting and presenting all accounting information, which is useful to the management. It is closely associated with management control, which comprises planning, executing, measuring and evaluating, the performances of an organization. Thus, Management accounting depends heavily on cost data and other information derived from Cost accounting.

Management accounting has a wider scope as compared to cost accounting. Cost accounting primarily deals with cost data while management accounting involves the considerations of both cost and revenue. Management accounting is an all-inclusive accounting information system, which covers financial accounting, Cost accounting and all aspects of Financial Management. But it is not substitute for other accounting functions. The main thrust in Management Accounting is towards determining policy and formulating plans to achieve desired objective of management. Management accountancy makes corporate planning and strategy effective and meaningful.

Cost Accounting and Financial Accounting

Financial accounting: is primarily concerned with the preparation of financial statement, which summarizes the results of operation for selected period of time and show the financial position of the corporation at a particular date.

Cost accounting: is primarily concerned with determination of cost of something, which may be a product, service, a process or an operation. A cost accountant is primarily charged with the responsibility of providing cost data for whatever purposes they may be required.

Management Accounting and Financial Accounting

Management accounting and financial accounting are linked by their responsibilities for summarizing and reporting information for interested parties, yet the two differ in some ways.

Financial accounting includes all the principles that regulate the accounting and reporting of financial information that must be disclosed to outside users, such as shareholder, creditors etc.

On the other hand, management accounting exists primarily for the benefit of managers inside a company, the people who are responsible for day-to-day operations of the firm. However, financial accounting and management accounting are part of and use data from a company's management information system. Much of the financial data generated by a company's events activities and actions are used for both financial and management accounting purposes.

Cost accounting integrates with financial accounting by providing product costing information for financial statements and with management accounting by providing some of the quantitative, cost-based information managers need to perform their tasks.

1.6.1. Cost accounting & management accounting comparison

These two types of accounting do not have clear cut territorial boundaries. However, distinction between the two may be made on the following points:

Basis	**Cost Accounting**	**Management accounting**
1. Scope	is limited to providing cost Information for managerial uses	Scope of management accounting is broader than cost accounting it provides cost accounting as well as Financial accounting for managerial uses.
2. Emphasis	Mainly emphasis on cost ascertainment & Control to ensure maximum profit.	Main emphasis on planning controlling and decision making to max profit.
3. Evaluation	Evaluation of cost accounting is mainly due to the limitation of financial accounting.	Evaluation of management accounting is due to the limitation of cost accounting. In fact, management accounting is an extent ion of the managerial aspects of cost accounting.
4.Techniques	Various techniques used by cost accounting	Management accounting also uses all

employed	include standard costing and variance analysis, marginal costing and cost-volume profit analysis, budgetary control, uniform costing and inter-firm comparison,etc.	these techniques used in cost accounting but in addition it also uses techniques like ratio analysis, funds flow statement, operation research and certain techniques from various branches of knowledge like mathematics which so-ever can help management in its tasks.

Fig.1.2 distinctions between Cost accounting & management accounting

1.6.2. Cost Accounting financial accounting comparison

Both cost accounting and financial accounting are concerned with systematic recording and presentation of financial data. The two systems rest upon the same principles concerning debit and credit and have the same sources of recording the transactions. But cost accounting is much more detailed than financial accounting. This is because in financial accounting profit or loss is ascertained for the business as a whole whereas in cost accounting detailed cost and profit data for various parts of business like departments, product, etc. are shown. This is explained in the following illustration.

Suppose a company is manufacturing three products-X, Y and Z. Under financial accounting and cost accounting, the following types of statements are prepared.

Under financial accounting A profit and loss Account is prepared to compute profit as shown below (data is assumed):

Profit and Loss account for the period…….

Birr	Birr
To material 75,000	By sales……..150,000
To wages……20,000	

To other expenses……25,000 To profit(balance figure)……..30,000 150,000	——— 150,000

Fig.1.3 Statement *of cost and profit under financial accounting*

This statement shows that total profit is Birr 30,000 but it does not disclose the details of profit /loss of each of products X, Y, and Z in the total profit. This is revealed by cost accounting

Under cost accounting A detailed statement is prepared as follows :(data of above Profit and Loss account with further assumptions).

Statement of cost and profit for the period……

	Total	Product X	Product Y	Product Z
	Birr	Birr	Birr	Birr
Materials	75,000	40,000	12,000	23,000
Wages	20,000	10,000	5,000	5,000
Other expenses	25,000	20,000	3,000	2,000
Total cost	120,000	70,000	20,000	30,000
Sales	150,000	96,000	28,000	26,000
profit/ Loss(-)	30,000	26,000	8,000	(-)4,000

Fig.1.4 statement of cost and profit under cost accounting

The above detailed statement prepared under cost accounting shows that in the total profit of Birr 30, 000, product X is contributing Birr 26,000 and product Y Birr 8,000, whereas product Z is showing a loss of Birr 4,000.when management gets this information, it will investigate to find out the reason of loss in product Z. if product Z cannot be made profitable, its production should be stopped to improve the overall profit picture of the company. However, this type of information is not revealed by financial accounting.

Differences between cost accounting and financial accounting are explained below:

Basis	**Financial accounting**	**Cost accounting**
1. purpose	The main purpose of financial accounting is to prepare profit and Loss, balance sheet for reporting to owners or shareholders and other outside agencies i.e., external users.	The main purpose of cost accounting is to provide detailed cost information to management, i.e., internal users.
2.statutory requirements	These accounts have to be prepared according to the legal requirements of companies Act and Income Tax Act.	Maintenance of these accounts is voluntary except in certain industries where it has been made obligatory to keep cost records under the companies Act.
3.analysis of cost and profit	Financial accounts reveal the profit or loss of the business as a whole for a particular period. It	Cost account show the detailed cost and profit data for each productline,department,process,etc.

	does not show the figures of cost and profit for individual product, departments and processes.	
4.Control of aspect	It lays emphasis on the recording of financial transactions and does not attach any importance to control aspect.	It provides for a detailed system of control with the help of certain special techniques like standard costing and budgetary control.
Historical and predetermined costs	It is concerned almost exclusively with historical records. The historical nature of financial accounting can be easily understood in the context of the purpose for which it was designed.	It is concerned not only with historical costs but also with predetermined costs. This is because cost accounting does not end with what has happened in the past. It extends to plans and policies to improve performance in the future.
Types of transactions recorded	Financial; accounting records only external transactions like sales,purchases,receipts, etc.,with outside parties.	Cost accounting not only records external transactions but also internal or inter-departmental transactions like issue of materials by store keeper to production departments.
Periodicity of reporting	Financial reports (Profit and Loss Account and Balance sheet) are prepared periodically, usually on an annual basis.	Cost reporting is a continuous process and may be daily,weekly,monthly,etc.

Fig1.5 Differences between cost accounting and financial accounting

Similarities

- Both are concerned with systematic recording and presentation of financial data
- The two system rest on the some principles concerning debit and credit
- Have the same sources of recording the transactions but cost accounting is much more detailed than financial accounting

Summary

This chapter has introduced and developed the meaning of the management accounting, cost accounting and has given an introduction to the management concept.

Cost accounting is the process of determining and accumulating the cost of product or activity. It is a process of accounting for the incurrence and the control of cost. Financial accounting is designed to meet external information needs and management accounting attempts to satisfy internal information needs. Cost accounting creates an overlap between financial accounting and management accounting. Cost accounting integrates with financial accounting by providing product costing information for financial statements and with management accounting by providing some of the quantitative, cost-based information managers need to perform their tasks.

Self-test questions

A. True or False? Give reason in brief.

1) In responsibility accounting, basic method of control is the same as used in the budgetary control and standard costing.
2) Organizing is that force which guides management in achieving objectives by comparing performance with policies and decisions.
3) Middle management group consists of /represented by/division manger, vice-presidents and the executives in charge of marketing.
4) Cost accounting is a branch of financial accounting.
5) The main purpose of cost accounting is to maximize profit.

B. **Choose the answer form the following given alternatives**.

1) One of the following is true :
    a) Cost accounting helps mangers in choosing among alternatives.
    b) Accountability stands for power to command others.
    c) Authority arises usually from lower management groups.
    d) Controlling is establishment of work framework through which the required activities are to be performed.
    e) All
    f) None

2) Which of the following is not the responsibility of cost department?

    a) Record manufacturing and non-manufacturing costs.
    b) Analyze all costs.
    c) Issue significant control reports.
    d) All but C
    e) All
    f) None

3) Management's systematic effort to achieve objectives by comparing performance to plan is called

    a) Controlling
    b) Planning
    c) Budgeting
    d) Organizing
    e) All
    f) None

4) All of the following are the advantages of cost accounting ***except,***

    a) It facilitates use of specialized cost reduction techniques.
    b) It helps to form cost centres and responsibility centres to exercise control.
    c) It provides the base for taking the best decision and give outright solution of the problem.
    d) It helps to formulate operating policies like whether to make or buy from out side sources.

e) None

5) Construction of detail operating programs for all phases of operation is called

a) Budgeting
b) Planning
c) Controlling
d) Organizing
e) None

6) controller is the executive manager responsible for a company's accounting function and performs all of the following functions except;
    a) Coordinate management's participation in planning and control phases of attaining objectives.
    b) Coordinate management's participation in determining the effectiveness of policies.
    c) Coordinate management's participation in creating organizational structure and procedures.
    d) All
    e) None
7) One of the following statements is not true cost accounting and management accounting comparison.
    a) Scope of cost accounting is limited to providing cost information for managerial uses.
    b) Scope of cost accounting is broader than that of management accounting.
    c) Evolution of cost accounting is mainly due to the limitation of financial accounting.
    d) The main emphasis of management accounting is on planning and controlling.
    e) None
8) One of the following is not the management accounting task:

    a) Supplying information for planning and decision making

b) Performance evaluation/to see whether assets are used efficiently.
c) Looking at the reasonableness of the cost incurred.
d) Cost determination.
e) All
f) None

9) The primary objective of cost accounting is:
   a) Guide to business policy.
   b) Control of cost
   c) Determination of selling price
   d) Ascertainment of cost.

10) _____ is defined as reduction in firm's equity, other than form withdrawal of capital for which no compensating value has been received.
   a) Expense
   b) Loss
   c) Cost
   d) Depreciation

B.**Fill in the blank spaces**.

1) _____ is a process of determining desirable and possible objectives, and of deploying resources to match then objectives.
2) _____ is the force that binds the organization together and the power to command others to perform or not to perform certain activities.
3) The management function that brings the many functional units of an enterprise into a well-conceived structure is known as _____.
4) _____ is the executive manager responsible for a company's accounting function.
5) The _____ department interviews, screens, and select employees for various job classification and maintains the wage rates and method of remuneration for each employee.

C. Objective questions

1) What is cost accounting? Discuss briefly its objectives and advantages.
2) Why has the budget cited as the most essential tool in cost accounting.
3) In what manner does the controller exercise control over the activities of other member of management?
4) State and explain the main differences between cost accounting and management accounting in your own words.
5) What are the functions of cost accountants in an industrial organization?
6) Numerous non-accounting departments require cost data and must also feed basic data to the cost department. Discuss.

Chapter Two

Introduction to cost terms and cost classifications

Learning Objectives:

At the end of this session you should be able to:

- Differentiate between cost, expenses and loss
- Distinguish between expired cost and unexpired cost and explain how to report these elements in the financial statements.
- Define cost classification and their basis of classification for the cost accounting information system.
- Describe the three categories of inventories commonly found in many manufacturing companies.
- Illustrate the flow of cost in a manufacturing enterprise and how to report the result of operation.

2.1 Introduction

This chapter explains several widely recognized cost concept and terms. They will help us demonstrate the multiple purpose of cost accounting system, which we will stress throughout the module.

Various cost concept and terms are useful in many contexts, including decision making in all areas of the value chain. They help managers decide such issues as, how much should we spend for research and development? What is the effect of product design changes on manufacturing costs? Should we replace some production assembly with a robot? Should we spend more of the marketing budget on sales promotion coupons and less on advertising? Should we distribute form a central warehouse or from regional warehouse?

2.2 Cost in general:

Accountants usually define cost as a resource sacrificed or forgone to achieve a specific objective. Most peoples consider cost as monetary amounts (such as dollars, pounds, Birr, yen)

that must be paid to acquire goods and services. But, the term cost does not have a definite meaning and its scope is extremely broad and general.

According to oxford dictionary, Cost means the price paid for something. However, some of the definitions of cost are given below:

- Cost is the amount of expenditure (actual or notional) incurred or attributable to a given thing.
- A cost is the value of economic resources used as a result of producing or doing the things costed (WM Harper)
- Cost means economic sacrifice, measured in terms of standard monetary unit, incurred or potentially to be incurred, as a consequence of a business decision to achieve a specific objective. (Committee on cost concept and SAAA)

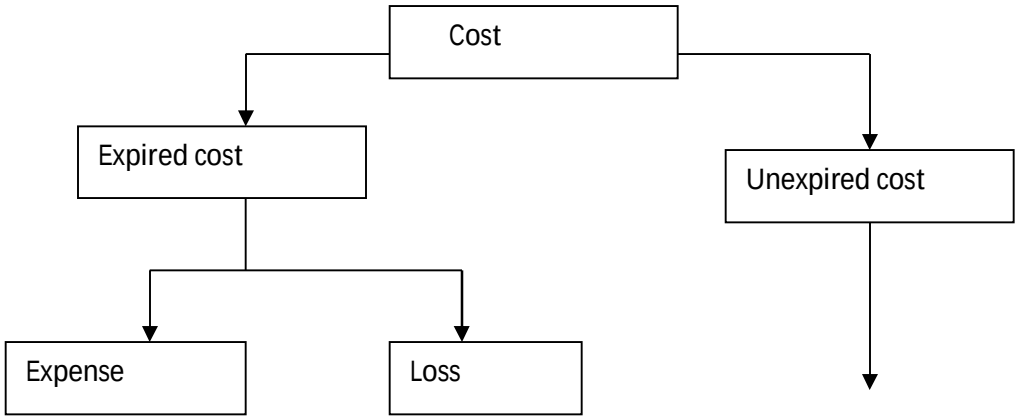
2.3 Cost Versus Expenses and loss:

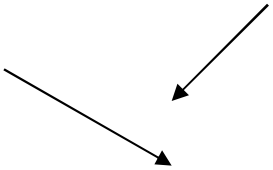
Expense is defined as an expired cost resulting from a productive usage of an asset. An expense is map portion of the revenue earning potential of an asset w/c has been consumed in the generation of the revenue.

Loss:

- Is a reduction in firms equity other than from withdrawals of capital for which no compensating value has been received.
- Is an expired cost resulting from the decline in the service potential of an asset that generated no benefit to the firm.

Ex. Obsolescence or destruction of stock by fire





Shown in balance sheet as an asset

Shown in profit and loss

Account on debit side

Fig 2.1 Relation of cost, expense and loss

Activity 2.1 Distinguish between expired cost and unexpired cost and explain how to report these elements in the financial statements.

Cost is ascertained by cost centers and cost unit or both.

Cost center: is location (e.g. a department, sales area, etc), person (e.g. sales man) or item or equipment (e.g. machine a delivery van, etc) for which costs may be ascertained and used for the purpose of control. In other words, it refers to a section of the business to which costs can be charged.

Cost centers are primarily of two types

1) **Personal cost center** – which consists of a person or a group of persons. Examples: a sales man, a machine operator, etc.
2) **Impersonal cost center**-which consist of a location or an item of equipment or group of these. Examples: a sales area, a department, a machine, a delivery van, etc.

From functional point of view, cost centers may be the following two types:

a) Production cost centers. - are those cost centers where actual production work takes place. Examples are

- Weaving department in textile factory
- Melting shop in a steel mil
- Cone crushing shop in a sugar mil

- Etc

(b) Service cost center. There are those cost centers which are ancillary to and render services to production cost centers

Example: power house

Stores department

Repair shop

Canteen etc.

Cost unit is a step further which breaks up the cost din to smaller sub- division and help in as curtaining the cost of saleable product or services. It is a unit of product, services or time in relation to which cost may be ascertained expressed.

2.4 Classification of costs

Classification is the process of grouping costs according to their common features. It is a systematic placement of like items together according to their common characteristics.

A. Direct and Indirect

Costs are classified in to direct costs and indirect costs on the basis of their deniability with cost unit or jobs or process or cost centers.

Direct costs: Direct costs are those costs which are incurred for and conveniently identified with a particular cost unit, process or department. Cost of raw materials used and wages of machine operator are common examples of direct cost. To be specific, cost of steel used in manufacturing a machine can be conveniently known. It is therefore, a direct cost. Similarly wages paid to tailors in a readymade garments company for stitching a piece of trouser is a direct cost because it can be easily identified in the cost of a trouser.

Indirect costs: These are general costs and are incurred for the benefit of a number of cost unit, processes, or department. These costs cannot be conveniently identified with a particular unit or cost centers. Depreciation of machinery, insurance, lighting, power, rent material used in repairs, etc. are common examples of indirect costs.

Costs are not traced or identified directly with a cost unit for one of the three reasons.

I. It is impossible to do so. E.g. rent of building.
II. It is not convenient or feasible to do so. Examples: Nails used in furniture
III. Management t chooses not to do so.

This classification is important from the point of view of accurate ascertainment of cost.

Activity2.2 In manufacturing a product, electricity accounts for 40 % of the total cost. There fore, it is a direct material cost. True or false? Discuss.

B. Fixed and variable costs

Costs behave differently when level of production rises or falls. Certain costs change in sympathy with production level while other costs remain unchanged.

Fixed costs: These costs remain constant in total amount over a wide range of activity for a specified period of time. These costs do not increase or decrease when the volume of production change. But fired cost "**per unit** "decreases when volume of prod increases and vice versa

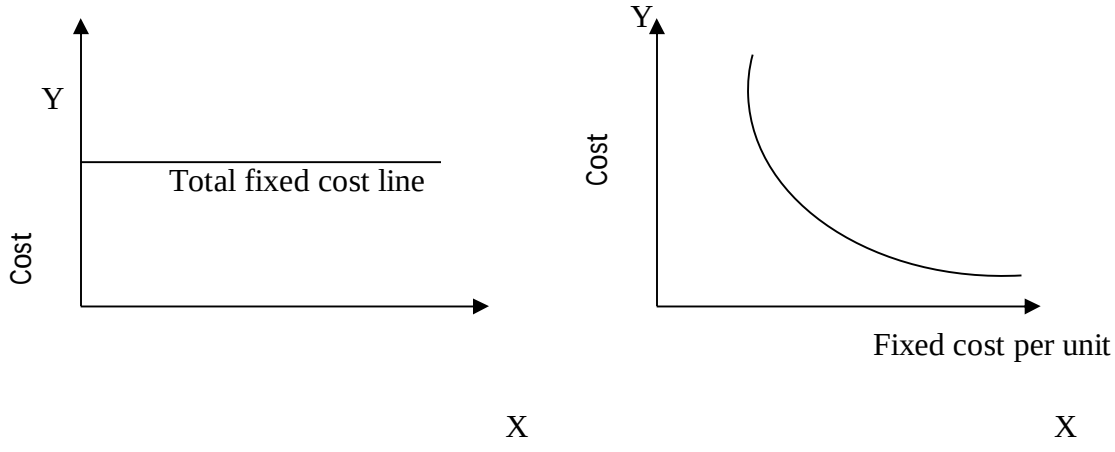


Fig .2.2 Behaviors of fixed costs

The characteristics of fixed cost: fixed costs special features that make them different form other types of costs. These are:

i. Fixed total amount with in a relevant out put range
ii. Increase or decrease in per unit when level of production changes
iii. Apportioned to department on some arbitrary basis
iv. Controlled mostly by top level management.

Variable cost: These costs tend to vary in direct proportion to the volume of output. Thus, in general, variable costs show the following characteristics:

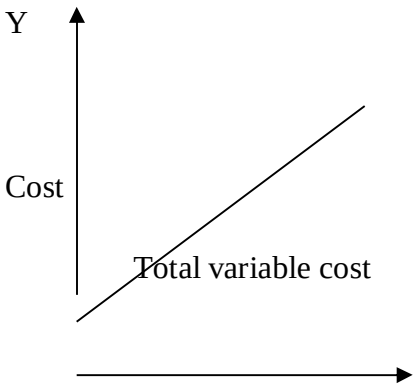
a) Variability of the total amount in direct proportion to the volume of output.
b) Fixed amount per unit in the face of changing volume
c) Easy and reasonably accurate & apportionment to department.
d) Such costs can be controlled by functional

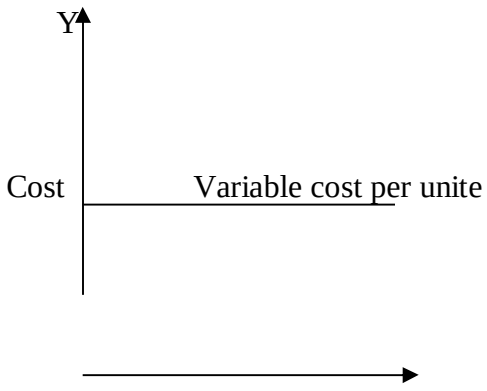
Fixed cost can be further classified as:

Committed – are those costs that are incurred in maintaining physical facilities & managerial setup. Once the decision to incur them has been made, they are unavoidable invariant in the short run

E.g. Depreciation of machinery & equipment

Discretionary- are those costs which can be avoided by management decision e.g. advertising, research & development, salaries of low level managers ,etc., because these cost may be avoided or reduced in the short run.





X X

Volume of production Volume of production

Fig: 2:3 Behaviors of variable costs

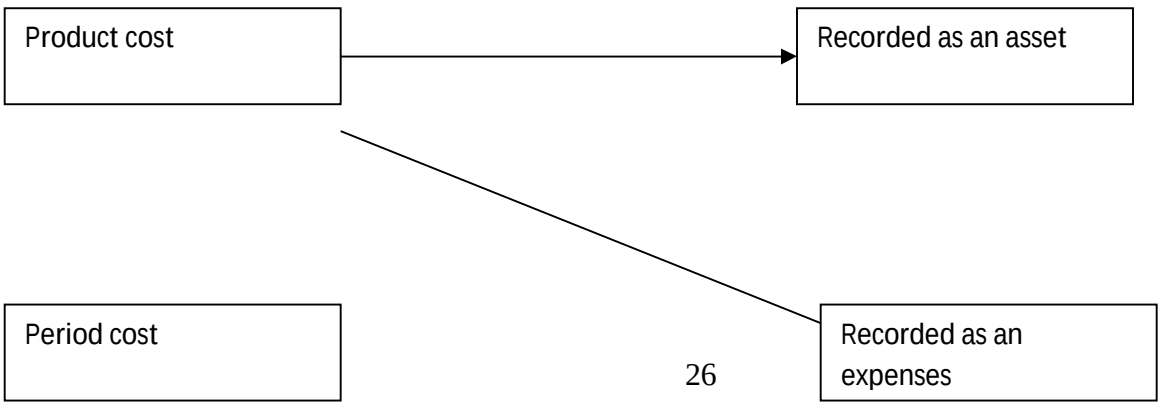
Activity2.3: Enumerate the characteristics of fixed and variable costs

C. Product cost and period costs

Product costs- are those costs which are necessary production and which will not be incurred if there is no production. These consists of direct material, direct labor and some of factory overhead product costs are absorbed by "or attached "to the units produced .these are called inventorial costs because these are included in the cost of product as work-in-process, finished goods or cost of sales.

Period costs -are those costs which are not necessary for production and are incurred even if there is no production .These are written of as expenses in the period in which these are incurred. For example, rent expenses, travel expenses, salary of company's executive, administration and selling expenses are generally treated as period costs

Note: classification into production and period cost is important from the point of view of profit determination



D. Controllable and non- controllable c costs

From the point of view of controllability costs are classified in to controllable and non-controllable costs.

Controllable costs: are those costs which may be directly regulated at a given level of management authority. Variable costs are generally controllable by department heads.

Non – controllable costs: are those costs which can not be influenced by action of a specified member of an enterprise.

For example, it is very difficult to control costs like factory rent, managerial salaries, etc.

1. Controllable cost can not be distinguished from non- controllable costs without specifying the level and scope of management authority.
2. All costs are controllable in the long run and at some appropriate management level.

Activity 2.4. The following are some of the ways in which costs may be classified

a) Direct and indirect
b) Variable and fixed
c) Controllable and un controllable

Bring out clearly the significance of each of these classifications and explain the meaning of the terms used there in

E. Historical and pre – determined costs: on the basis of time of compute costs can be classified as historical and pre-determined costs.

Historical costs: are the costs which are ascertained after these have been incurred.

They are thus, nothing but actual costs. They are not available until the completion of the management operation.

Pre – determined costs: Are future costs which are ascertained in advance of production on the basis of a specification of all the factors affecting cost. Used for the purpose of planning and control.

F. Normal and Abnormal costs

Normal cost may be defined as a cost which is normally incurred on expected lines at a given level of out put. This cost is a part of cost of prod.

Abnormal cost is that which is not normally incurred at a given level of out put. Abnormal is not treated as a part of the cost of production and it is charged to costing profit and loss account.

G. Common and Joint Costs

Common costs: costs of facilities or services employed by two or more operations

Joint costs: occur when the production of one product may be possible only if one or more other products are manufactured at the same time.

H. Capital expenditure and Revenue expenditure

Capital expenditure: intend to benefit future periods and is recorded as asset

Revenue expenditure: benefit the current period and is recorded as expense

Ultimately the asset (capital expenditure) will flow in to expense stream as it is consumed or when it loses its usefulness.

2.5 Producing department Vs service department cost

This classififactio0n is a classification of costs in relation to manufacturing departments. The departments of a factory generally fall in to two categories:

a Producing department
b Service department

a. **Producing department** is also known as operating department. A producing department is one in which manual and machine operation are performed directly up on any part of the product manufactured in many cases producing departments are further subdivided in to cost pools.

b. Service department is one that is not directly engaged in production but render a particular type of service for the benefit of other service department as well as the producing department

Examples: Repair and maintenance department

Receiving and inspection department

Data processing, time keeping

Store room, cafeteria, payroll, budgeting, Plant protection, etc

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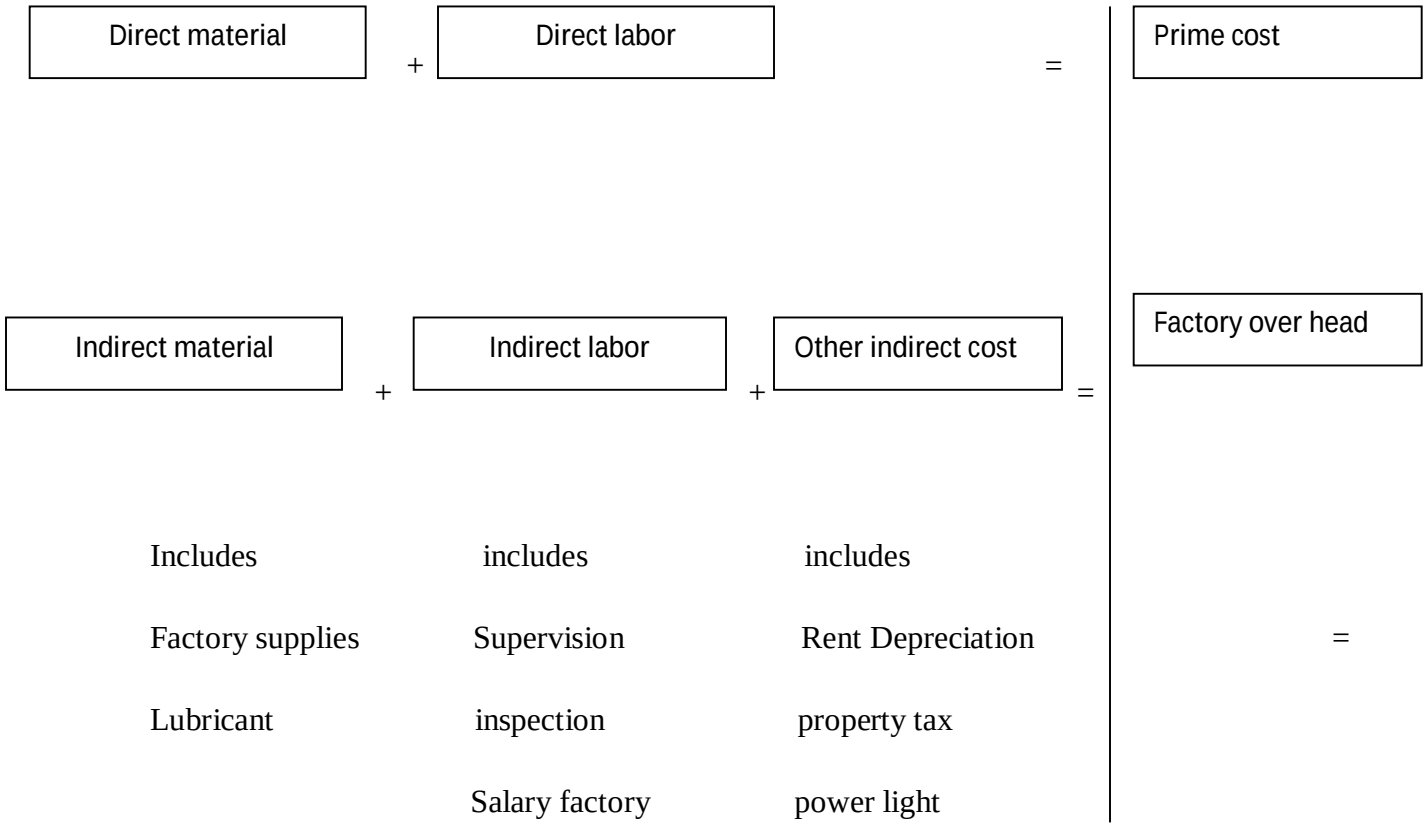
ANALYSIS OF TOTAL OPERATING COST



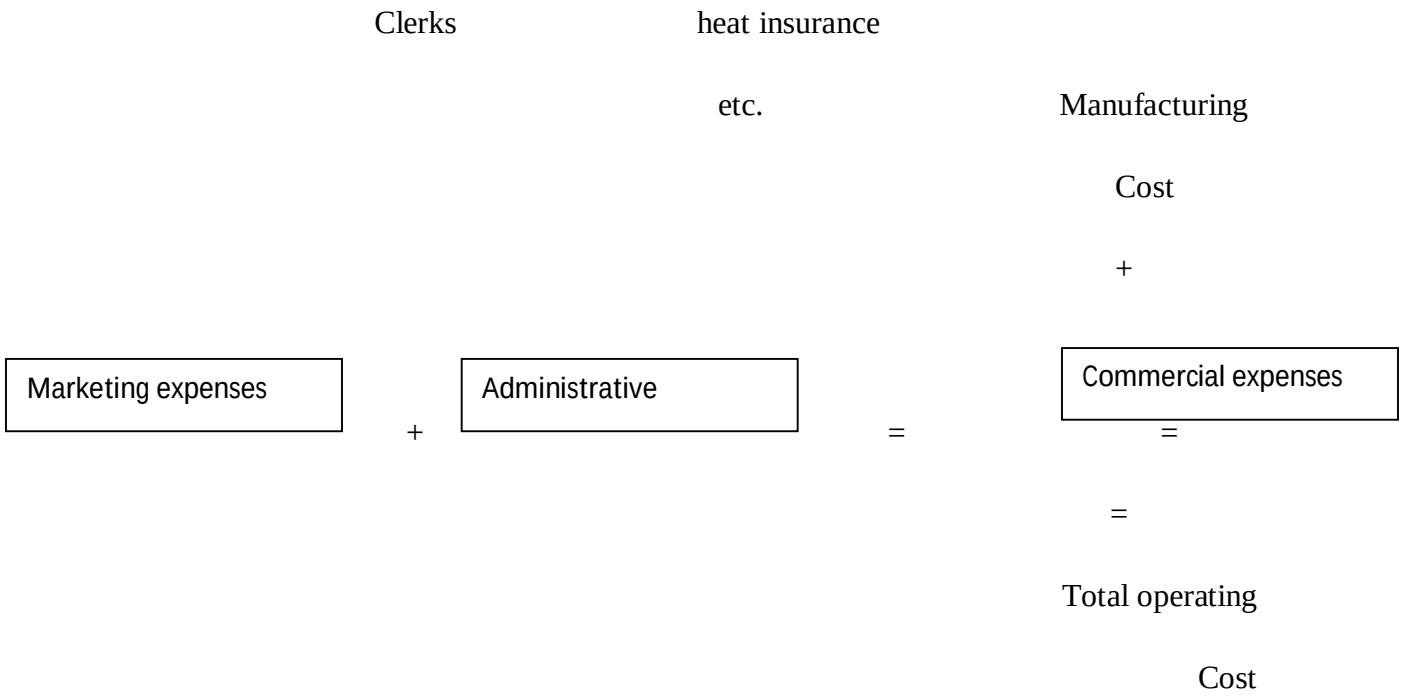


Fig.2.4 *ANALYSIS OF TOTAL OPERATING COST*

Elements of cost

A cost is composed of three elements i.e. material labor & expense. Each of these elements may be direct or indirect.

Labor cost: - *This is "the cost of remuneration (wages, salaries, commissions, bonuses. Etc) of the employees of an undertaking"*

Direct labor

Direct labor cost consists of wages paid to workers directly engaged in converting raw materials in to finished product.

These wages can be conveniently identified with a particular product job or process. Examples: Wages paid to a machine operator is a case of direct wages.

Indirect labor

It is of general character and cannot be conveniently indented with a particular cost unit. In other words, indirect labour is not directly engaged in the production operations but only to assist or help in production operations.

Expenses

Are all costs other than material and labor are termed as expenses. It is defined as "the cost of services provided to an undertaking and the notional cost of the use of owed assets."

Direct expense According to CIMA London, "direct expenses are those e expenses which can be identified with and allocated to cost centres or units." These are those expenses which are specifically incurred in connection with a particular job or cost unit. Direct expenses are also known as ***chargeable expenses.***

Indirect expenses

All indirect costs, other than indirect materials and indirect labour costs are termed as an indirect expense. These cannot be conveniently identified with a particular job, process or work order and are common to cost units or cost centres.

2.6 The manufacturing cost Accounting cycle

The manufacturing process and the physical arrangement of a factory are the skeleton upon which the cost system and cost accumulation procedures for the manufacturing function are built.

Since cost accounts are an expansion of general accounts, they should, as a basic accounting procedure be related to them. This relationship leads to the concept of the tie-in of cost accounts with general accounts as illustrated below. Accounts describing manufacturing operation are material, payroll ,factory over head control, work-in-process, finished goods, and cost of good

sold. Each fiscal period, these accounts recognize and measure the flow of costs from the acquisition of materials, through factory operations, to the cost of product sold.

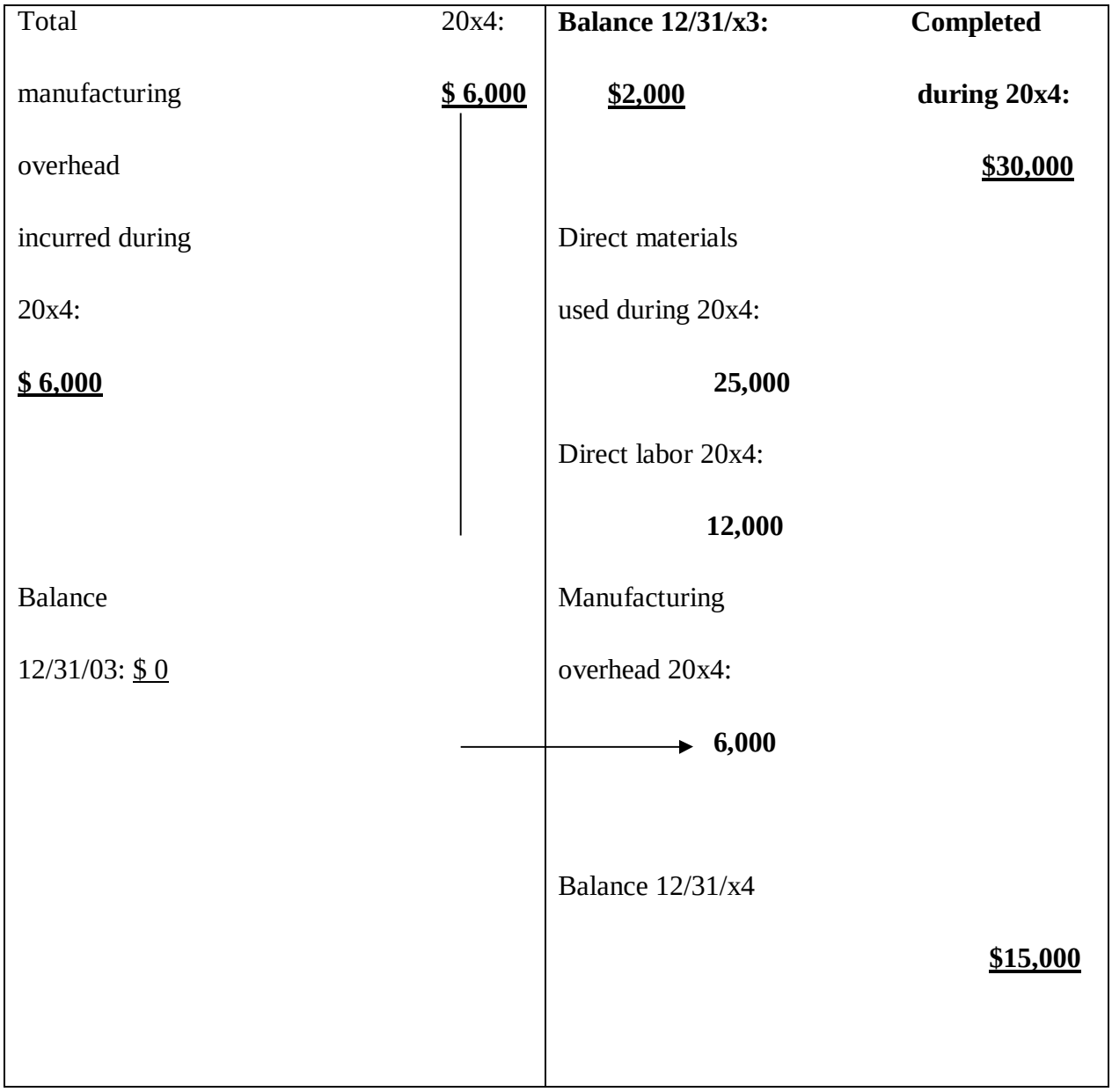
Work in Process **Inventory Account**		**Work in Process** **Inventory Account**	
Balance 12/31/x3: $10,000 Total direct materials purchased during 20x4: 20,000 Balance 12/31/x4: $5,000	Used during 20x4: **$25,000**	Balance 12/31/x3: $ 2,000 Direct materials used during 20x4: **25,000** Direct labor 20x4: 12,000 Manufacturing overhead 20x4: 6,000 Balance 12/31/x4 $15,000	Completed during 20x4: $30,000

Beginning Balance + DM purchase - Ending DM Balance =DM used

Factory Payroll **Account**	**Work in Process** **Inventory Account**
Direct labor earned during 20x4: **$12,000** 20x4: $12,000 Balance 12/31/x4: $ 0	**Balance 12/31x3: $ 2,000\ Completed during 20x4: $30,000** Direct materials used during 20x4: 25,000 Direct labor 20x4: **12,000** Manufacturing overhead 20x4: 6,000 Balance 12/31/x4

	$15,000

Manufacturing Overhead **Control Account**	**Work in Process** **Inventory Account**


Total manufacturing overhead incurred during 20x4: $ 6,000
Balance 12/31/03: $ 0
20x4: $ 6,000
Balance 12/31/x3: $2,000
Direct materials used during 20x4: 25,000
Direct labor 20x4: 12,000
Manufacturing overhead 20x4: 6,000
Balance 12/31/x4
Completed during 20x4: $30,000
$15,000

Work in Process **Inventory Account**	**Finished Goods** **Inventory Account**

Balance 212/31/x3: $2,000 Direct materials used during 20x4: 25,000 Direct labor 20x4: 12,000 Manufacturing overhead 20x4: 6,000 Balance 12/31/x4 $15,000	Completed during 20x4: **$30,000**
Balance 12/31/x3: $6,000 Completed during 20x4: **30,000** Balance 12/31/x4: $12,000	Sold during 20x4: $24,000

Finished Goods **Inventory Account**		**Cost of Goods Sold** **Account**
Balance 12/31x3: $6,000 Completed during 20x4: 30,000 Balance 12/31/x4: $12,000	Sold during 20x4: $**24,000**	Sold during 20x4: **$24,000**

ACTIVITY 2.5

The balance in the Work in Process Inventory account on April 1 was $31,600, and the balance on April 30 was $22,600. Costs incurred during the month were as follows:

Direct materials	41,250
Direct Labor	17,300
Manufacturing Overhead	32,600

What was the amount transfer to Finished Goods Inventory account during April?

Reporting the Results of Operation

Illustration

BARAF manufacturing enterprise begins a new fiscal with the following financial position

BARAF manufacturing company

Balance sheet

Jan 1, 2008

Asset

Current Asset:

Cash……..……..…. $183,000

Marketable securities ……..... 76,000

Account receivable (net) …….. 313,100

Inventories:

Finished goods …… 68,700

Work in process …… 234,300

Material ……..…....135,300 438,300

Prepaid expenses…….……. 15,800

Total Current Assets ……... 1,026,200

Property, plant and equipment:

Land …….…….… 41,500

Building …….……. 580,600

Machinery and equipment …….……..… 1,643,000

Accumulated depreciation…… (1,010,700) 1,212,900

Total property, plant and equipment……..… 1,254,400

Total Assets …….……. 2,280,600

Liabilities

Current Liabilities:

Accounts payable……. $553,000

Estimated income tax payable ……. 35,700

Due on long term debt……..… 20,000

Total current liabilities ……..…..…… 608,700

Long-term debt ……..….. 204,400

Total liability ……...…. 813,100

Stockholders' Equity

Common stock …….. 528,000

Retained earnings …….. 939,500

Total stockholders' equity…….. 1,467,500

Total liabilities and stockholders' equity ……...…… 2,280,600

During the month of January, the company completed the following transactions

a) Materials purchased and received on account for $ 100,000

Materials ……. 100,000
Accounts payable …….. 100,000

b) Materials requisitioned in the month amount $80,000 and $12,000 for production and indirect factory use respectively.

Work in process…….. 80,000
Factory Overhead Control ……. 12,000
Materials ……..92,000

c) Total gross payroll, $160,000. The payroll is paid to employees after 7% FICA tax and 12% federal income tax are deducted.

Payroll…… 160,000
Income tax payable …… 19,200
FICA tax payable ……... 11,200
Cash ……. 129,600

d) The distribution of payroll was: Direct Labor (65%), indirect factory labor (15%) marketing salary (13%) and administrative salaries (7%).

Work in Process…… 104,000
Factory Overhead Control……..….. 24,000
Marketing Expense Control…….20, 800
Administrative Expense Control……..… 11,200
Payroll ……160,000

e) Additional 10% is recorded for the employer's payroll taxes: FICA TAX 7%, Federal unemployment insurance tax 1% and state unemployment insurance tax 2%.

Factory Overhead Control…….….. 12,800
Marketing Expense Control……. 2,080
Administrative Expense Control……1,120

FICA tax…… 11,200

Federal unemployment insurance tax …….……. 1,600

State unemployment insurance tax ……...…… 3,200

f) Factory Overhead consisting $8,500 and 1,200 for depreciation and prepaid insurance respectively is recorded

Factory Overhead control …….. 9,700
Accumulated depreciation ……8,500
Prepaid Expense …… 1,200

g) General overhead cost (not itemized) amounts $26,340. 70% of these expenses were paid in cash and the balance is credited to Account Payable account

Factory Overhead control …….. 26,340

Cash……. 18, 438

Accounts payable ……..…….……. 7,902

h) $205,000 is collected from credit customers in settling their obligations.
Cash…… 205,000
Accounts receivable …….. 205,000

i) Account payable $ 227,000 and Estimated income tax $35,700 is paid

Account payable …….. 227,000

Estimated income tax …….. 35,700

Cash …….262, 700

j) The balance of Factory Overhead control account is transferred to the work in process account

Work in process…… 84,840
Factory Overhead control …….…… 84,840

k) Work completed and transferred to the finished goods amounts $320,000

Finished Goods……. 320,000

Work in process …….. 320,000

l) Sales, $384,000. 40% paid in cash and the balance is charged to Accounts Receivable account. The cost of goods sold was 75% of sales.

Cash……... 153,600
Accounts receivable ……. 230,400
Sales …… 384,000

Cost of Goods sold ……. 288,000
Finished Goods ……. 288,000

m) Provision for income tax, $26,000
Provision for income tax ……. 26,000

Estimated income tax payable ……26,000

BARAF manufacturing company

Cost of Goods Sold statement

For the month ended Jan 31, 2008

Direct Materials:

Materials inventory, Jan 1, 2008 ……..	135,300	
Purchases ……	100,000	
Materials available for use ……..	235,300	
Less: indirect materials issued ……...….	12,000	
Materials inventory, Jan 31, 2008 …….	143,300	155,300
Direct material consumed ……..….....		…80,000
Direct labor ……		……96,000
Factory overhead:		
Indirect materials ……..	12,000	
Indirect labor …….	24,000	
Payroll taxes ……..	12,800	
Depreciation ……..	8,500	
Insurance ……..…	1,200	
General factory overhead ……..…	26, 340	84,840
Total manufacturing cost ……		... 260,040
Add: work in process inventory as of Jan1, 2008 ……..…….		...234,300
		494,300
Less: work in process as of Jan 31, 2008 ……		174,340
Cost of goods manufactured ……		320,000
Add: finished goods inventory as of Jan 1, 2008 …..……...…		68,700
Cost of goods available for sale ……		388,700
Less: finished goods inventory as of Jan 31, 2008 …….....		100,700
Cost of goods sold ……		288,000

BARAF manufacturing company

Income statement

For the month ended Jan 31, 2008

Sales …….		384,000
Less: CGS ……..		(288,000)
Gross profit ……..….		96,000
Less: commercial expenses		
Marketing expenses ……	22,880	
Administrative expenses …….	12,320	35,200
Income from operation ……		60,800
Less provision for income tax ……..…		26,000
Net income ……...		34,800

ACTIVITY 2. 6:

From activity 2.5 Calculate the total manufacturing cost for the period:

Calculating Unit Cost- Manufacturing

The cost per unit of a product is found by adding all its cost and dividing it by the number of units produced.

In manufacturing, for example, it will include:

Materials	$1,000
Labor	$2,000
Overhead	$5,000
Total Cost	$8,000

Number of Units Produced 10,000

Unit cost =total cost / number of units produced

Unit Cost = (10,000/ $8,000) = **$1.2**

Self-Test Questions

A. **True or False**. Indicate whether each of the following statement is true or false. Give reasons in brief.

1) Variable cost per unit remain unchanged when out put is increased or decreased.
2) Loss means expired cost while expense means expired cost as well as unexpired cost.
3) Abnormal cost is uncontrollable
4) Conversion cost is the aggregate of direct labour and manufacturing overhead.
5) Nails used in furniture manufacture are an indirect material cost.
6) A producing department is one in which manual and machine operations are performed indirectly upon any part of the product manufactured.

7) Commertial expenses are the aggregate of marketing expenses and administrative expenses.
8) Direct materials + direct labour + factory overhead +commercial expenses = total operating costs.
9) Job order costing applies where work is under taken to customers' special requirements.
10) The basis for the classification of cost as direct and indirect is the identifiablity of costs to cost units or process or cost centres.

B. Fill in the blank spaces

1) Aggregate of all direct costs is known as _____.
2) Factory cost plus office and administration overhead is equals to _____.
3) _____ is a unit of product, service or time in relation to which costs may be ascertained.
4) Indirect materials plus indirect labour plus _____ = overhead.
5) _____ are future costs which are ascertained in advance of production on the basis of a specification of all the factors affecting cost.

C. multiple choice questions

1) Warehousing cost is :
    a) production overhead
    b) selling overhead
    c) administration overhead
    d) distribution overhead
2) Telephone bill falls in the category of
    a) fixed cost
    b) semi-variable cost
    c) variable cost
    d) stepped cost
3) Allotment of whole items of overhead to cost centres is known as:
    a) allocation
    b) apportionment
    c) classification

d) absorption

4) The cost that form a part of production and incurred normally on expected line at a given level of output is:
   a) indirect cost
   b) controllable cost
   c) uncontrollable cost
   d) abnormal cost
   e) normal cost

5) Service department is one that is not directly engaged in production but render a particular type of services for the benefit of other service department as well as the producing department. Based on this definition, one the following can not be examples for service department.
   a) Repair and maintenance department
   b) Data processing department
   c) Storeroom
   d) Cafeteria
   e) Budgeting department
   f) None

6) _____ are those cost centres where actual production work takes place.
   a) Personal cost centres
   b) Service cost centres
   c) Production cost centres
   d) Impersonal cost centres

7) Identify wrong statement(s) from the followings. (***There may be more than one answer***)

   A. variable cost per unit varies with increase or decrease in the volume of output
   B. conversion cost is equal to direct wages plus factory overhead
   C. fixed cost per unit remains fixed
   D. All costs are controllable.
   E. An item of cost that is direct for one business may be indirect for another.

8) ----- are those costs that are incurred in maintaining physical facilities, managerial setup and unavoidable once the decision to incur them has been made.

A. Period costs
B. Pre-determined
C. Committed costs
D. Discretionary costs
E. Historical costs

9)) If Dm represents direct materials; DL represents direct labor ;PC represents prime cost ;FOH stands for factory overhead ; IM represents indirect materials ; IL represents indirect labors ; M represents manufacturing costs ; CE stands for commercial expenses ; Top represents total operating costs ,which one is wrong about the relationship of these operating costs ?

A. PC + FOH = M
B. DM + DL = Pc
C. TOP - CE = PC + FOH
D. M = TOP + CE

10) Based on their traceability with cost unit or jobs or processes, costs can be classified as------ &----- costs.

A. Fixed and variable
B. Product costs &period costs
C. Direct & indirect
D. Controllable & non-controllable
E. Normal & abnormal

D. Objective questions

1) What is classification and why is it so important to business organization?
2) Give a realistic example of each of the following
    a) Direct materials
    b) Direct labour
    c) Indirect material
    d) Indirect labour
    e) Indirect expenses
3) What are prime costs? And identify the components of prime costs.

4) Define committed and discretionary costs and compare their nature with the general characteristics listed under fixed costs.
5) Explain why a variable cost is said to be variable and why a fixed cost is said to be fixed.

E. practical questions

Q1. From the following information for the month January, prepare a cost sheet to show the following components. (A) Prime cost,

(b) Factory cost,

(c) Cost of production,

(d) Total cost.

Direct material……57,000

Direct wages……...28,500

Factory rent……..2,500

Office rent and rates……. 500

Plant repairs and maintenance……. 1,000

Plant depreciation……... 1,500

Factory manager's salary…… 2,000

Factory heating and lighting …….. 400

Office salaries……..... 1,600

Telephone and postage…… 200

Legal charges ……. 150

Printing stationary…….. 900

Advertisement ……. 1,500

Sales men's salaries……. 2,500

Showroom rent…… 500

Sales ……..116,000

Q2. The December 31, 2009 trial balance of the FENET Company showed:

Sales…….4, 000,000

Sales return and allowances……. 25,200

Purchase (net)……...2,400,000

Direct labor……...3,204,000

Sales salaries……. 200,000

Transportation in…….. 32,000

Factory overhead…….. 1,885,000

Advertising expenses…… 155,000

Delivery expense…….. 65,000

Inventories:

	January1, 2008	December 31, 2008
Finished good……..	467,400	620,000
Work-in-process……..	136,800	129,800
Materials……..	196,000	176,000

Required:

a) Total manufacturing cost.
b) Cost of goods manufactured.
c) Cost of goods sold.

Q3. Arba Minch textile factory has its general office in Addis Ababa but its plant is in Arba Minch a separate set of record is kept at the home office and at the factory. The factory started its operation on Jan 1,200. During the first month of its operation the following transactions occurred

a) Material purchased on account $33,000

b) Direct materials of $22,000 were requisitioned along with indirect materials of $6,500 and $2500 of supplies
c) Total payroll was $30,000. The home office prepared the payroll and the checks and deducted 6.5$ of FICA tax and 10% for federal income tax. The state unemployment insurance tax rate is 2.1% the federal un employment insurance tax rate is 7%. The payroll consisted of office salaries of $3,000. Sales salaries of $8,000 indirect labor of $4000 and direct labor of $15,000.
d) Factory applied at a rate of 110% of direct labor cost.
e) Material costing $275 were defective & were returned to the supplier
f) Payment made to vendors on account $31,500.
g) Various factory overhead expenses totaled $2000, including $400 depreciation on factory machinery.
h) Goods completed totaled $48,300.
i) Goods costing $45,000 were sold for $65,000.

Required: Record /pass/ the necessary journal entries on the books of general office and the factory books.

CHAPTER THREE

JOB, PROCESS AND OPERATION COSTING

Aims and objectives

After completing this chapter, you should be able to:

- *Distinguish between process costing and job-order costing.*
- *Identify the documents used in a job-order costing system.*
- *Compute predetermined overhead rates and explains why estimated overhead costs (rather than the actual overhead costs) are used in the costing process.*
- *Prepare journal entry to record costs in job-order costing system.*
- *Describe the basic characteristics of process costing*
- *Prepare a departmental production report using the weighted average method and FIFO method.*
- *Describe the basic features of operation costing.*
- *Describe the basic characteristics of process costing, including cost flows, journal entries, and the cost of production report.*
- *Describe process costing for settings without work-in-process inventories.*
- *Define equivalent units, and explain their role in process costing.*
- *Prepare a departmental production report using the weighted average method and FIFO method.*
- *Prepare a departmental production report with transferred-in goods and changes in output measures.*
- *Describe the basic features of operation costing.*
- *Explain how spoilage is treated in a process costing system*

Introduction

As a tool of attaining the profit maximization objective of the business firm cost accounting consists of three basic phases:

1. cost determination and measurement
2. cost planning and control through budgets and standards
3. cost analysis for decision making

3.1. Concepts: costing system, cost pool, cost allocation bases

Cost accounting is a sub-field of accounting that measure, records, reports, and interprets information about costs. In any type of firm, therefore, Cost accounting system focuses on cost determination. For manufacturing firms, cost accounting system will systematically determine the three Manufacturing cost elements, cost of direct materials, cost of direct labor and cost of factory (Manufacturing) overheads incurred to produce an item.

There are two main types of product costing systems. Companies select a method that best matches the flow of work in their business. These methods are used to allocate all production costs: direct materials, direct labor and factory overhead. Each costing system gathers and reports on the same information. The method used depends on the needs of the business.

These product costing systems are:

1) Job-order costing system
2) Process costing system

1) **Job-order costing (or simply job costing)**

Job-costing is used when different types of products, jobs, or batches are produced or it is the method of allocating costs of products that are readily identified by individual units or batches, each of which to requires varying degree of attention and skill. The cost unit (object) is the jobs, the work order or contract; the records will show the cost of each. Industries that commonly use job- order method include construction, furniture, manufacturing of tailor made or unique goods, ship builders, and etc.

The cost accounting procedures are designed to assign costs to each job. The costs assigned to each job are averaged over the units of production in the job to obtain average cost per unit.

For example, suppose that Mega printing enterprise worked on two printing jobs during September 2013, and the following costs were incurred:

	Job A 27	*Job B 39*
	(1,000 Campaign posters)	*(100 wedding invitations)*
Direct Materials	*Br100*	*Br36*
Direct labor	*250*	*40*
Factory over head	*150*	*24*
Total manufacturing cost	*Br 500*	*Br 100*

The cost per campaign poster is Br 0.50 (Br 500 divided by 1000 posters) and the cost per wedding invitation is Br 1.00 (Birr 100 divided by 100 invitations)

2) **Processes costing**

Process costing is used by companies that produce large numbers of identical products and/or when units are not distinguishable from one another during one or more manufacturing processes. This costing method accumulates all the production costs for a large number of units of output, and then these costs are averaged over all of the units produced. The cost object is the department, processing center or the production line.

The following conditions may also exist in process costing:

1) The product of one process becomes the material (input) of the next process.
2) Different products or even by-products are produced by the same process.

The process costing method is applicable to industries such as flour mills, breweries, chemical Industries, oil refining, and many others.

For example, Moha millennium plant at Hawassa produced 400,000 bottles of soft drink specifically Pepsi cola during September, 2013. The following manufacturing costs were incurred in September.

Direct Materials	*Birr 150,000*
Direct labor	*200,000*

Factory over head	*150, 000*
Total manufacturing cost	*Birr 500,000*

The cost per bottle is birr 1.25(total manufacturing cost of birr 500,000 divided by 400,000 bottles produced).

These costing systems have got two major purposes that they satisfy simultaneously. These purposes are identified as:

1) Planning and controlling purpose; and
2) Product costing purpose

The planning and control purpose focuses on cost data provided through cost accounting system for planning, decision making, and performance evaluation. Managers need to know future cost data in setting their goals and objectives. They want to know how much cost is incurred to produce an item and also they need to know how work is performed by comparing the actual costs with the budgeted ones and then identify, analyze and take actions on the deviations.

The product costing purpose focuses on the inventory valuation, determination of periodic net income and income tax reporting. Thus, Accountants need to determine total cost of products and costs of individual unit of product in order to determine cost of inventories and cost of goods sold.

- ***Cost object*** – anything for which a separate measurement of costs is desired.
- ***Direct costs of a cost object*** – costs that are related to the particular cost object and can be traced to it in an economically feasible (cost-effective) way.
- ***Indirect costs of a cost object*** – costs that are related to the particular cost object but cannot be traced to it in an economically feasible (cost-effective) way. Indirect costs are allocated to the cost object using a cost-allocation method.
- ***Cost pool*** – a grouping of individual cost items. Cost pools can range from the very broad (such as a company-wide total-cost pool for telephones and fax machines) to the very narrow (such as the costs of operating a car used by a travelling salesperson).
- ***Cost-allocation base*** – a factor that is the common denominator for systematically linking an indirect cost or group of indirect costs to a cost object. A cost-allocation base can be financial

(such as direct labor costs) or non-financial (such as the number of car kilometers travelled). Companies often seek to use the cost driver of the indirect costs as the cost-allocation base. For example, the number of kilometers travelled may be used as the base for allocating motor vehicle operating costs among different sales districts.

After the cost unit has been selected questions as to the cost accumulation process might be arise. For that matter decision must be made whether to compile & allocate actual costs to the units of production or to assign costs on a standard cost basis. These allocation bases are:

1) Actual Costing System

An actual or historical costs system collects the costs as they occur but delays the presentation of results until manufacturing operations have been performed or services rendered. Though the cost object is charged with actual quantities and cost of materials used and labor expended, the factory in many cases is allocated on the basis of a predetermined overhead rate.

$$\text{Actual manufacturing overhead rate} = \frac{\text{Actual annual manufacturing overhead costs}}{\text{Actual annual quantity of the cost-allocation base}}$$

2) Normal Costing System

Normal costing is a costing system that (1) traces direct costs to a cost object by using the actual direct-cost rates times the actual quantities of the direct-cost inputs and (2) allocates indirect costs based on the budgeted indirect-cost rates times the actual quantities of the cost-allocation bases.

A predetermined or budgeted indirect-cost rate is calculated for each cost pool at the beginning of a fiscal year, and overhead costs are allocated to jobs as work progresses. For the numerator and denominator reasons already described, the budgeted indirect-cost rate for each cost pool is computed as follows:

$$\text{Budgeted indirect cost rate} = \frac{\text{Budgeted annual indirect costs}}{\text{Budgeted annual quantity of the cost-allocation base}}$$

How do you implement a normal-costing system?

A general seven-step approach to normal costing requires identifying (1) the job, (2) the actual direct costs, (3) the budgeted cost-allocation bases, (4) the budgeted indirect cost pools, (5) the budgeted

cost-allocation rates, (6) the allocated indirect costs (budgeted rate times actual quantity), and (7) the total direct and indirect costs of a job.

In a standard cost system unit costs are predetermined in advance of production. Products, operations and processes are costed using standards for both quantity costs applied are called variances.

Difference between Actual & Budgeted Costing Methods

The only difference between costing a job with normal costing and actual costing is that normal costing uses budgeted indirect-cost rates, whereas actual costing uses actual indirect-cost rates calculated.

Actual costing and normal costing differ in the type of indirect-cost rates used:

	Actual Costing	Normal Costing
Direct-cost rates	Actual rates	Actual rates
Indirect-cost rates	Actual rates	Budgeted rates

Both systems use actual quantities of inputs for tracing direct costs and actual quantities of the allocation bases for allocating indirect costs.

	Actual Costing	Normal Costing
Direct Costs	*Actual direct-cost rates* × actual quantities of direct-cost inputs	*Actual direct-cost rates* × actual quantities of direct-cost inputs
Indirect Costs	*Actual indirect-cost rates* × actual quantities of cost-allocation bases	*Budgeted indirect-cost rates* × actual quantities of cost-allocation bases

Cost accumulation procedures: - Job order or Process

Both the actual and standard cost systems may be used in connection with either job order or process costing.

Cost Accumulation procedures		
	Job order Costing	Process Costing
Cost Object	Individual or Distinct unit of a product or service	Mass of identical or similar units of a product or services

JOB ORDER COSTING

Job-order costing is the cost accumulation system under which costs are accumulated by jobs, contracts, or orders. This costing method is appropriate when the products are manufactured in identifiable lots or batches or when the products are manufactured to customer specifications. Job-order costing is widely used by custom manufacturers such as printing, aircraft, and construction companies. It may also be used by service businesses such as auto repair shops and professional services. Job-order costing keeps track of costs as follows: Direct material and direct labor are traced to a particular job. Costs that are not directly traceable-factory overhead-are applied to individual jobs using a predetermined overhead (application) rate.

JOB COST SHEET

The cost sheets are subsidiary sheets /records/ controlled by the work in process account. By the time when several jobs or orders are going on through a factory, different cost sheets designed to collect the cost of materials, labor and factory overhead charged to a specific job. Each cost sheet is assigned a job number which has to be placed on each material requisition and labor time ticket used in connection with a job. These forms of materials and labor are totaled daily or weekly by job number for summary journal entries, and the details are entered on the cost sheets. The factory overhead balance entered on the cost sheet is preferably computed on the basis of an estimate (standard) rather than the actual cost incurred.

Costs sheets differ in form, content, and arrangement in each business. But the upper section of each cost sheet must provide space for the following elements. Job number, the name of the customer, the

description of the item to be produced, the quantity of the item to be produced, the date started & the date completed.

The lower section summaries the production costs, commercial expenses, & profit.

JOB COST SHEET

Job Number 2B47 Date Initiated March 2

Date Completed March 8

Department Milling

Item Special order coupling Units Completed 2

For Stock

Direct Materials		Direct Labor			Manufacturing Overhead		
Req. No.	Amount	Ticket	Hours	Amount	Hours	Rate	Amount
14873	$ 660	843	5	$ 45	27	$8/DLH	$216
14875	506	846	8	60			
14912	238	850	4	21			
	$1,404	851	10	54			
			27	$180			

Cost Summary		Units Shipped		
Direct Materials	$1,404	Date	Number	Balance
Direct Labor	$ 180	March 8	2	0
Manufacturing Overhead	$ 216			
Total Product Cost	$1,800			
Unit Product Cost	$ 900*			

*$1,800 ÷ 2 units = $900 per unit.

3.2 Job order costing system features

The main features of job-costing are:

- *Production is undertaken against customer's orders.*
- *Each job has its own characteristics and satisfies the requirement to the customer.*
- *Duration of job is normally short. However, a large order may extend beyond one year.*
- *Identity of each order is maintained throughout the manufacturing process.*
- *Only prime cost elements are traceable and overheads are apportioned to each job on some suitable basis.*

3.2. Accounting procedures for job order costing system

Accounting for Materials

Merchandise inventory and purchases are familiar accounts in trading concern. In manufacturing enterprises, it is common practice to record all materials and supplies on one control account called Materials. Cost accounting procedures that affect the materials account involves:

1. Purchase of Materials and
2. The issuance of Materials for factory use.

Recording Purchase & Receipts of Materials

Cost accounting techniques for the purchase of materials are a bit different form those studied in general accounting. The entry is shown below

Materials ----------xx

Accounts payable/cash ---------- xx

The quantity received, unit cost and amount of each purchase is also entered in the materials ledger card.

If materials returned back to the venders

Account payable/cash ----------xx

Materials ---------- xx

Recording issuance of Materials

When the job is started, the necessary materials are issued to the factory on the basis of Materials requisitions forwarded from the production unit. The requisition bears the job order number and specifies the type and quantity of materials required. The copy of the requisition is send to the store keeper, who assembles the materials called for production requisition. The quantity, unit cost, and total cost of each item is entered on the requisition and posted to the materials ledger account.

The transfer of Materials from the store room to factory is recorded as a transfer of materials from the materials inventory account to the work in process account and can be recorded as follows.

Work in process ---------- xx

Materials ---------- xx

A copy of each requisitioned is also sent to the cost department. In this department, the requisitions are totaled, sorted by job numbers and entered in the materials section of the cost sheet for the jobs indicated.

If Materials originally required for job (production) are not used, a returned materials report is prepared and the materials will be returned back to the store room. The return requires journal entry and could be recorded as follows:

Materials ---------- xx

Work in process ---------- xx

Supplies that will not be used by the factory may be charged to marketing or Administrative expense accounts. When supplies are issued for factory use, they are charged to the factory overhead control account

Factory overhead control ---------- xx

Materials ---------- xx

For control purposes, the requisitions for factory supplies must also be recorded in a subsidiary ledger for factory supplies and must also be recorded in a subsidiary ledger for factory overhead, which may be a factory over head analysis sheet.

The effect of these transactions on the materials accounting is shown below:

Materials

March			
1. Inventory	$100,000	Mar, 31.Return	2,000
31. Purchases	25,000	31. Direct Materials	
	$ 125,000	requisition	31,000
		31. Indirect materials	
	$86,000	requisition	6,000

$39,000

Accounting for labor

The accounting procedure for labor may be divided into two distinct phases:

1. Collection of payroll data, computation of earnings, calculation of payroll taxes & payment of wages.
2. Distribution & allocation of labor costs to jobs, departments and other cost classifications.

To compute the labor cost of a given order, the time spent on each job during the day must be recorded in each worker's time ticket. The time tickets are in turn, priced in the payroll department to permit computation of employee's gross earnings.

At regular intervals, usually daily, or weekly, the labor time & the labor cost for each job are entered on the job order cost sheets.

Example: Payroll during the month of Dec, 2011

Dec, 15th	**Dec 31st**
Direct labor $12,000	Direct labor $15,000
Indirect Labor 1,800	Indirect Labor 2,200

Assume further that the Co. withholds 15% for Income tax and 6% of Pension tax. The journal entry would be

Dec, 15th	**Dec, 31st**
Payroll ----------13,800	Payrolls ---------- 17,200
Employer inc. tax payable ----- 2,070	Employer Inc. tax payable ------2,580
Pension tax payable ---------- 828	Pension tax payable ---------- 1,032
Accrued payroll ---------- 10,902	Accrued payroll ---------- 13,588

At each payroll date payment to workers would be recorded as follows

Dec, 15th		**Dec, 31st**
Accrued payroll ----------	10,902	13,588
Cash ----------	10,902	13,588

If the employer is expected to contribute 7.5% Pension tax, 2.7% state unemployment tax and 0.7% federal unemployment tax the entry at end of the month would be recorded as follows.

FOH ----------	$ 3,379
Pension tax payable ----------	2,325
State unemployment tax payable ----------	837
Federal unemployment tax payable ----------	217

The payroll account is the labor cost clearing account kept in the record as convenience, pending analysis of the labor time tickets & distribution of the labor costs to the proper accounts.

The distribution is usually recorded on a daily or weekly basis, so that labor cost remain current on the job order cost sheets and are available to operating management. The payroll account and employer taxes account may also include amounts applicable to marketing and administrative personal. Such costs would be charged to marketing and administrative expense account.

To distribute the total cost incurred, the following month –end summary entry would be recorded (indirect labor, 4,000)

Work in process ----------	27,000	
FOH ----------	4,000	
Payroll ----------		31,

Accounting for Factory Overhead

The quantity and cost of materials and labor used on a given order can generally be measured in a straight forward and reasonably exact manner. But measuring the balance of factory overhead to be charged for the job presents more involved problem.

Many of the overhead costs may not be known until the end of a fiscal period, long after the job has been completed. Therefore, actual overhead cannot be charged to jobs on timely basis. To enhance cost control in such costs, it is common to use a *predetermined overhead rate* which is based on estimated factory overhead balance.

Estimated Factory Overhead: - is FOH entered on the job order cost sheets on the basis of a predetermined factory overhead based *on direct labor hours, direct labor cost, Machine hours or other appropriate base*. In principle the accountants determine casual relationship between two factors, such as the direct labor hours and FOH, and use this relationship as a means of charging factory overhead to jobs.

For example assume that the direct labor hours of company "X" for the month of Jan, 2011 were estimated to be 9,000 hours and factory overhead is as estimated to be $22,500. These estimates lead to the assumption that for each hours of direct labor there should be $2.5 ($22,500)/ (9000) of factory overhead to be applied for production. The job order cost sheet for any job done during the period would disclose the factory overhead applied to the job (Direct labor hours x predetermined rate).

Applied FOH account: - The applied factory overhead entered on the job order cost sheet for each job is the basis for the following entry (Assume that the job consumes 5,280 direct labor hours)

Work in process ……. 13,200

Applied Factory overhead, (5,280 hrs x $2.5) ……. 13,200

The applied factory overhead account is closed to the actual factory overhead control account at the end of the accounting period by the following entry.

Applied Factory overhead ……. 13,200

Factory overhead Control…….…. 13,200

An Applied FOH account is used because it keeps applied overhead and actual overhead costs in separate accounts. Some companies do not use the applied FOH account, but credit FOH control when work in process is debited. This procedure eliminates the need to transfer the balance of Applied FOH to FOH control account.

Actual FOH: - Some actual overhead costs such as indirect materials and labor and payroll taxes are charged to factory overhead control as they are incurred. Other overhead costs, such as depreciation and expired insurance, are charged to FOH control account when adjusting entries are recoded.

For example, factory depreciation and expired insurance with a value of $682 & $516 respectively are recorded at the end of the accounting period by the following entry.

FOH Control…… 1, 198

Accumulated Depreciation …….. 682

Prepaid insurance……. 516

The balance of FOH control account for Co. "X" can be summarized as follows

FOH

Mar. 31 indirect materials	$ 6,000	Mar. 31. Over head	
31, indirect labor	4,000	Applied to WIP	13,200
31,indirect taxes	3,379		
31, Depreciation	682		
31, insurance expense	516		
	$14,577		$1,377

The balance of $ 1,377 in the factory overhead control account indicates that the actual expense exceeded the overhead applied to the job orders.

Note: Difference between the actual cost and applied cost is calculated by subtracting actual cost from the applied cost. Where the applied cost is greater than the actual cost it is favorable variance, but where the applied cost is lesser than the actual cost it is unfavorable variance.

Problems of over- head Application and Period – end adjustments

Problems of overhead Application

Budgeted (predetermined) indirect cost rates have the advantage of being timelier than actual indirect cost rates. With predetermined rates, indirect cost can be assigned to individual jobs on an ongoing basis rather than waiting until the end of the accounting period when actual cost will be known. However, the disadvantage of predetermined rates *is that they will probably be inaccurate,* having been made up to 12 months before actual costs are incurred. Besides, the following may contribute immensely for the difference between the actual rate and the predetermined overhead rate:

1) The use of single or dual application rate, and
2) The use of plant – wide or departmental overhead application rate.

1) The use of single or dual application rate

It is obvious that manufacturing overhead costs can be grouped into variable and fixed cost depending on the behavior of costs. The presence of fixed manufacturing overhead costs is a major reason for difficulties in overhead application. So as to minimize the difficulties faced and for other purposes, firms may develop different application rates to apply manufacturing overhead costs to production. Moreover, the cost driver may differ for variable and fixed manufacturing overhead cost. The basic procedure will remain the same, except that the individual overhead cost would be gathered into one cost pool or the other account depending on its behavioral pattern. The two different application rates would be used to put overhead cost into work in process inventory. These are the variable overhead application rate and the fixed overhead application rate.

2. The use of plant wide or departmental overhead application base

A firm may have many departments. The question of overhead application is whether to use single, plant wide application rate or to use overhead application rate computed (developed) for each department involved in the production process. Sometimes the assumption that a single application rate can serve may not warrant. In such cases firms will use different overhead application rates for each department instead of a single, plant wide rate.

A departmental overhead application rate is used to apply overhead costs of a single department. Each department will have its own rate, and might use different application base. The basic procedures of applying overhead costs remain the same as in single rate method except that the relevant cost drivers selected in each department governs the amount of overhead applied. Besides, over applied or under applied overhead cost is completed for individual department. There are two conditions which may encourage firms to use departmental overhead application rates. These are:

1. Different departments' Overhead costs may be associated with different measure of activity cost driver. Some departments may be capital intensive and the cost driver tends to be total machine hours operated, others may be, labor intensive and hence the overhead cost driver tends to be direct labor hour worked or direct labor cost. In such situations using single rate developed on single measure of activity will not suffice.
2. Some departments may have different rate of usage as compared to other with regard to overhead items. The single rate method obese cures this important difference.

Example:

Department	***Budgeted over head (a)***	***Budgeted labor hours(b)***	***Overhead rate (a/b)***
Assembly	$ 240,000	50,000	$240,000 ÷ 50,000hrs=$4.80 /DLH
Finishing	120,000	50,000	$120,00 ÷ 50,000hrs= $2.40/DLH
Total	$360,000	100,000hrs	$360,000 /100,000hrs =3.60/ DLH

DLH: Direct labor hours.

Assume that job 101 and job 102 were worked in both assembly and finishing departments. The following data are on hours used by each job in each department:

Job	**Assembly hours**	**Finishing hours**	**Total hours**
101	300	50	350
102	150	200	350

Required: calculate the overhead applied by using the two methods?

Solution:

Over head applied to each job would be:-

- **Using single rate method:**

  Job 101: $3.60 x350 hrs = $1,260

  Job 102: $3.60 x 350 hrs = $1,260

  As illustrated above, jobs with differing times in different departments but same total time have the same overhead charge when a single rate is used.

- **Using departmental rate :**

  Job101: From Assembly department, $ 4.80x300 hrs =$1.440

  From finishing department, $2.40 x 50 hrs = 120

  Total cost allocated to job101= $ 1,560

  Job 102: From Assembly department t = $4.80x150 hrs = $ 720

  From finishing department = $ 2.40 x 200 hrs = 480

  Total cost allocated to Job102 = $ 1,200

The central point of the above example is that misleading results might follow the use of a single plant wide application rate.

The Disposition of under - applied or over - applied Factory overhead *(Use of standard costs & end of period adjustment)*

The advantage of using standard (budgeted) indirect cost rates instead of actual costing is that indirect cost can be assigned to jobs on ongoing and timely basis rather than only at the end of the accounting period when the actual costs are certainly known. However, standard rates are likely to be inaccurate, because they are based on estimates made at the beginning of operation before actual costs are incurred. Therefore the need for adjustments to correct this inaccuracy is inevitable.

Under applied FOH occurs when the allocated (applied) amount of indirect costs in an accounting period is less than the actual (incurred) amount in that period. Over applied FOH occurs when the allocated (applied) amount of indirect costs in an accounting period is more than the actual (incurred) amount in that period.

Under or Over applied =	Actual factory	–	Applied factory
Factory overhead	overhead incurred		overhead
Adjustments			

1. Adjusted Allocation Rate Approach

This approach, in effect, restates all entries in the general and subsidiary ledgers by using actual cost rates rather than standard cost rates. First the actual indirect cost rate is computed at the end of the year. Then every job to which indirect costs were allocated during the year has its amounts recomputed using the actual indirect cost rate (rather than the predetermined standard cost rate). Just after the closing entries are made the job cost will amend the variances. The ending WIP control, Finished Goods control, and CGS accounts will accurately represent actual indirect costs incurred.

2. Proration approach

Proration is the spreading of under/over applied overhead among the ending balances of work in process, finished goods and cost of goods sold. Materials inventory is not included in this proration because this account didn't first of all, take any applied overheads. Proration can be held based on:

1. Applied indirect cost proportion or

2. End balances of Work in Process, Finished Goods, and Cost of Goods Sold.

Example: Assume the following data:

	Year-end balance	Overheads
WIP	50,000	$16,200
FG	75,000	31,320
CGS	2,375,000	1,032,480
Total	2,500,000	1,080,000

If a total of $135,000 balance of FOH was found under allocated.

Required: prorate under and over applied overhead balance under the two methods?

	Year-end balance		reallocated under applied FOH
WIP	50,000/2.500,000=0.02% *135,000	=	2700
FG	75,000/2.500,000=0 .03%*135,000	=	4050
CGS	2,375,000/2.500,000=0.95%*135,000	=	128,250
Total	2,500,000		135,000

Year-end balance Overheads

WIP	$16,200/1,080,000 =0.015% *135,000=2,025=18225
FG	31,320 /1,080,000 =0.029%*135,000=3,915=35235
CGS	1,032,480/1,080,000=0.956%*135,000=129,060=1,161,540
Total	1,080,000+135,000=1,215,000

3. Write off to cost of goods sold approach

In this case, the total under/over applied overhead is included in the current year's cost of goods sold. Therefore, increasing or decreasing the balance of CGS by under/over applied balance will help us in keeping the accuracy of our periodic income measurement.

For our case, the journal entry would be as follows

Cost of goods sold ----------135,000

Applied Factory overhead ---------- 1,080,000

FOH control ---------- 1,215,000

No matter which approach is used the under allocated overhead is not carried in the overhead accounts beyond the end of the year. That is, the ending balance in manufacturing overhead allocated (applied) are closed to work in process control, finished goods control, or cost of goods sold account and consequently its balance become zero at the end of each year.

3. PROCESS COSTING SYSTEM

Introduction

Process costing; one of the two cost accumulation procedures, is best used in industries processing chemicals, petroleum, textile, steel and etc. it is used when products are manufactured under conditions of continuous processing or under mass production methods. That is why process costing procedures are often termed as **« *Continuous or mass production*** » Cost accounting procedures.

The application of job order or process costing procedures in an organization is highly determined by the nature of the product which the organization is going to produce. For example a company manufacturing custom machinery will use job order costing where as a chemical producing company will use process costing.

Characters tics & procedures of process costing

The characteristics of process costing are

1. The cost of production report is used to collect, summarize and compute total and unit costs
2. Production is accumulated & reported by departments
3. Costs are posted to departmental work in process account
4. Production in process at the end of a period is restated in terms of completed units
5. Total cost charged by a department is divided by total production units of the department to determine the unit cost for a specific period
6. Cost of completed units of a department is transferred to the next processing department in order to arrive at the total costs of the finished products during a period. At the same time costs are assigned to units' till in process.

Procedures of process costing

1. Accumulate Materials, labor and factory overhead costs by departments.
2. Determine unit costs for each department
3. Transfer costs from one department to the next and to Finished Goods
4. Assign costs to the inventory of work still in process.

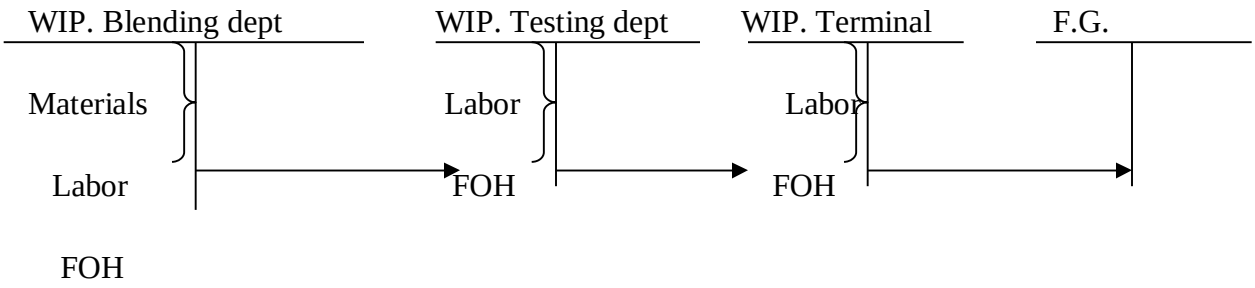
Costing by departments

The nature of a manufacturing operation in firms using process or job order costing procedures is usually takes production tasks from different departments. For that matter, what ever the cost procedure method is applied, each department is responsible to perform a specific operation or process towards the completions of production. While processing each department will consume (charge) a certain amount of materials, labor and FOH for the accomplishment of its tasks. For example, have a look at the diagram below, it is clearly depicted that just after a Blending department has completed the starting phase of work on the product, units are transferred to testing department after which they may go to terminal department for completion and transfer to FG store room. When units are transferred from one department to the other the associated cost incurred in each department will also be transferred along with the physical flow products. Finally the cost of completed units is determined by dividing the total cost of a period by the total units produced during the same period. Departmental total and unit costs are determined by the use of the cost of production report.

Product Flow Methods

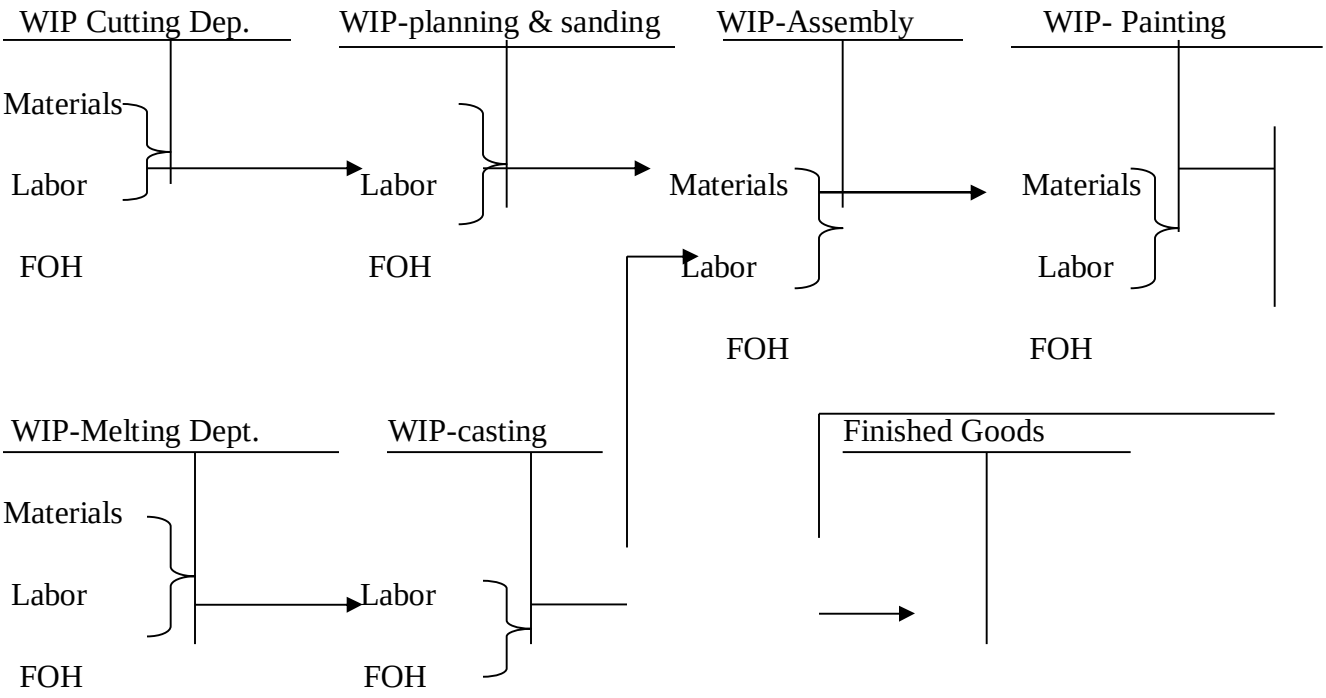
A product can flow through a factory in many ways. Three product flow formats associated with process costing are depicted below.

a) **Sequential product flow**



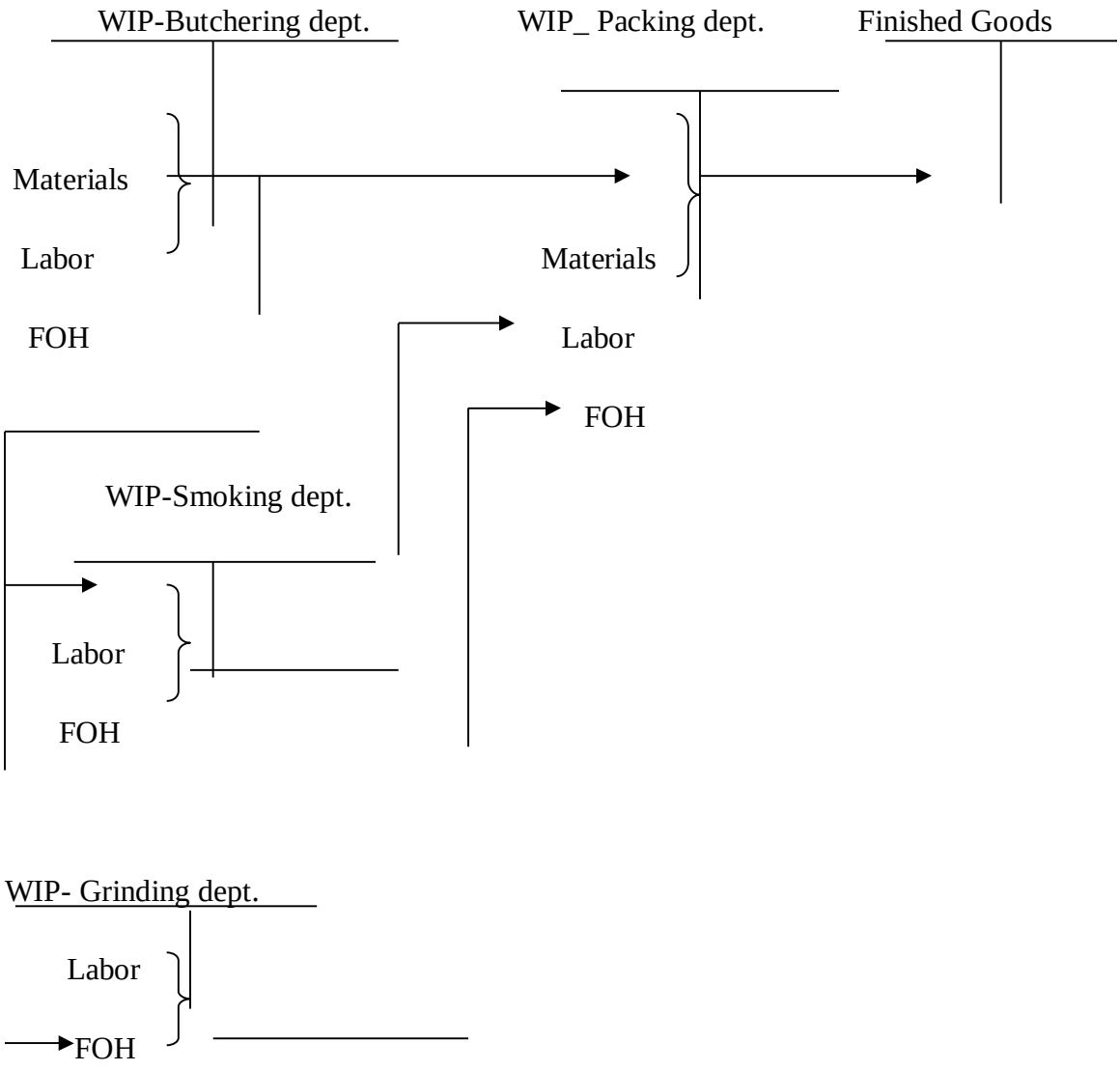
In this type of product flow each item manufactured goes through the same set of operation. Materials are placed into production in the Blending department and labor and FOH are added as well. When the work is finished in the Blending department it moves to the Testing department. The second process & any succeeding processes may add more materials or simply work on the partially completed input from the preceding department adding only labor & FOH.

b) Parallel product flow



In this method certain portion of the work are done simultaneously in different departments, and then brought together in a final process or processes for completion and transfer to completed goods inventory

c) Selective product flow



Here the product moves to different departments within the plant depending up on the desired final product.

Procedures for Materials, Labor & Factory Overheads

In process costing materials, labor & FOH costs are accumulated in the usual accounts. Costs are then analyzed by department or processes and charged to departments by appropriate journal entries.

For control purposes, materials need not always be priced individually on requisition forms. The cost of materials used can be determined at the end of the production period through inventory difference procedure i.e. add purchase to beginning inventory and then deduct ending inventory. Or Consumption reports which state the cost of materials or quantity of materials put into process by various departments can be used.

The possible journal entry to be maintained when materials are charged for production is as follows

WIP-Blending department ……xxx

Materials ……xxx

In process costing Labor costs are identified by and charged to department, and thus eliminating the detailed clerical work of accumulating labor costs by jobs. Summary of labor charges are made to departments through an entry which distributes the direct manufacturing payroll.

WIP-Blending department ……xxx

WIP-Testing department ……..xxx

WIP-Terminal department ……xxx

Payroll ……xxx

If we use actual FOH for other manufacturing cost incurred during production, we would able to determine the accurate /perfect/ cost of production of a certain product. This method is best suitable if production is held at constant rate, but if the reverse is happen (production varies) the predetermined FOH is used.

Prior to charging of the balance of FOH to production we should record the balance of each expense (cost) categories entitled under it. This can be done as follows

FOH control ----------xxx

Accounts payable ----------xx

Accumulated Depreciation- Machinery ---xx

Prepaid insurance ----------xx

Materials ----------xx

Payroll ----------xx

When FOH is charged to production

WIP-Blending department---------xxx

WIP – testing department ---------xxx

WIP- terminal department ---------xxx

FOH Control ----------xxx

The Cost of Production Report

The departmental cost of production report shows all costs chargeable to a department. It would help being a source for year end (Month end) journal entries, & presenting and disposing of costs accumulated during the month.

The cost of production report of one department shows

1.The total and unit costs of goods transferred (received) from the preceding department(s)
2. Materials, labor & factory overhead added by the department
3.Unit costs for each cost categories added by the department
4.Total & unit costs accumulated to the end operation in the department
5.The cost of beginning & ending WIP inventories and
6.Cost transferred to the succeeding department or FG store room

It is customary to divide the cost section of the report in to two parts: **one** showing costs for which the department is accountable (including departmental and cumulative total & unit costs) and **the other** showing the disposition of these costs. A quantity schedule showing the total number of units for which a department is accountable and the disposition made of these units is also part of each department's cost of production report. Information in this schedule, adjusted for equivalent production, is used to determine the unit costs added by a department, for costing of the ending work in process inventory and computing the total cost to be transferred to the next department.

A cost of production report determines periodic total & unit costs. As controlling demands detailed presentation of cost data, showing total figures by it self mean very little for it. Therefore in most cases the total cost is broken down by cost elements for each department (responsible for the costs incurred). And this detailed data is needed to account the various completion steps of the work in process inventories.

Either in the cost of production report itself or in the supporting schedules each item of material used by the department is listed, every labor operation is showed separately, factory overhead components are noted individually and unit costs are derived for each item.

Process Costing with No Beginning or Ending Work-in-Process Inventory

On January 1, 2012, there was no beginning inventory of SG-40 units in the assembly department. During the month of January, Pacific Electronics started, completely assembled, and transferred out to the testing department 400 units.

Data for the assembly department for January 2012 are as follows:

Physical Units for January 2012

Work in process, beginning inventory (January 1)	0 units
Started during January	400 units
Completed and transferred out during January	400 units

Work in process, ending inventory (January 31)	0 units

Physical units refer to the number of output units, whether complete or incomplete. In January 2012, all 400 physical units started were completed.

Total Costs for January 2012

Direct material costs added during January	$32,000
Conversion costs added during January	24,000
Total assembly department costs added during January	$56,000

Pacific Electronics records direct material costs and conversion costs in the assembly department as these costs are incurred. By averaging, assembly cost of SG-40 is $56,000/ 400 units = $140 per unit, itemized as follows:

Direct material cost per unit ($32,000 /400 units)	$80
Conversion cost per unit ($24,000 /400 units)	60
Assembly department cost per unit	$140

Process Costing with Some Beginning and Some Ending Work-in-Process Inventory

Example: The quantity schedule of the cost of production report of ABC Company shows that cutting department has 50,000 units put in process during the month of October, 2013. Of which 45,000 are competed and transferred to the next department. 4,000 units are still in process and 1,000 units are lost during production.

Materials, labor and FOH added by the department are amounted $24,500, 29,140 and 28,200 respectively. In addition, ending WIP for the department is added with full materials needed for completion of production, but labor & FOH charged are half of the total required amount.

Required: Prepare a cost of production report for ABC Company

ABC Company

Cutting department

Cost of production report

For the month ended, November 2013

Quantity Schedule

Units started in process …… 50, 000

Units transferred to next department ……..45,000

Units still in process (all materials-1/2 Labor & FOH)…. 4,000

Units lost in process …… 1,000 50,000

Cost charged to the department

	Total Cost	**Unit Cost**
Costs added by the department		
Materials	$24,500	$0.50
Labor	29,140	0.62
FOH	28,200	0.60
Total cost to be accounted for	$81,840	$1.72

Cost accounted for as follows

- Transferred to next department (45,000 x $1.72)		$77,400
- Work in process ending inventory		
Materials (4,000x$0.5)	$2,000	
Labor (4,000x1/2 x0.62)	1,240	
FOH (4,000 x ½ x0.60)	1,200	4,440

Total cost accounted for $81,840

Additional Computations

Equivalent unit of production:

- Materials = 45,000+4,000= 49,000 unit
- Labor & FOH = 45,000 +1/2 x4, 000 = 47,000 Units

Unit cost: Materials = $\frac{\$24{,}500}{49{,}000} = \$0.5/unit$

$$\text{Labor} = \frac{\$29{,}140}{47{,}000} = 0.62/unit$$

$$\text{FOH} = \frac{\$28{,}200}{47{,}000} = \$0.60/unit$$

Equivalent Units of Production: - in many manufacturing processes all materials are issued at the start of production but all conversion costs are generally added to the process uniformly through time. Therefore, the 4,000 units still in process for cutting department of company ABC have all the materials need for their completion but of labor & FOH are charged Only 50%. And we can infer that, the total amount of labor and FOH charged into units still in process can be converted (stated) into the amount of completed output units that could be made with that quantity of input. For example, if 50 units of a product in ending work in process inventory are 70% completed with respect to conversion costs, there are 35 (70% * 50 units) equivalent units of production for conversion costs. This restatement of uncompleted works in terms of completed units is called computation of **equivalent units of production**. That is, if all the conversion costs input in 50 units' inventory were used to make complete output units, the company would able to make 35 units of output. Therefore, in light with the above example we can say that (in terms of equivalent units of production) the balances of labor & FOH added to WIP inventory of the cutting department are sufficient to complete **2,000** units. Equivalent units are computed separately for each cost categories of Materials, Labor & FOH.

Unit costs: Departmental cost of production report indicates the cost of units as they leave each department. These individual unit costs are accumulated into a completed unit cost for the period. Unit costs are determined for each cost components based on the respective computed equivalent production units.

Disposition of Department costs

In the department cost report the section titled **"cost charged to the department"** shows the total cost charged to the production under the custody of the department. The section titled **"Cost accounted for as follows"** shows the disposition of this cost into transferred goods & work in process. The WIP figure must be broken down into its component parts of materials, labor & FOH.

Lost units: continuous processing leads to the possibility of waste, shrinkage and other factors which cause lost or spoilage of production units.

Units lost in the first department: lost units reduced the number of units over which total cost can be spread, causing an increase in unit costs. The 1,000 units lost in cutting department increases the unit costs of units transferred and still in processes in respect to materials, labor and FOH. Had these units not been lost the equivalent production figure would be 50,000 for materials 48,000 units for labor & FOH. And unit cost for each component will be reduced accordingly.

Cost of Production Report for Second Department

Assume that the 45, 000 units transferred from the cutting department to the next department were made to the Assembly department where labor and FOH were added before the units were transferred to the third (Finishing) department. Costs incurred by the assembly department resulted in additional departmental as well as cumulative unit costs. The cost of production report of the Assembly department differs from that of the cutting department in several respects. As many additional calculations are to be made, for which, space has been provided on the report. The additional information deals with

1. Units received from the preceding department
2. an adjustment of the preceding department's unit cost because of lost units, and
3. Cost received from the preceding department to be included in the cost of the ending work in process inventory.

The Journal entry that has to be made by Assembly department when processes are received from the Cutting department is as follows

WIP – assembly Department ……..77,400

WIP - Cutting Department……..……...77,400

Example

Assume that the quantity Schedule for the Assembly department of ABC Co. shows that the 45,000 units received from the cutting department were accounted as follows: 40,000 units sent to the Finishing department, 3,000 units still in process and 2,000 units lost during production. An analysis of the WIP ending inventory indicates that units in process are one third (1/3) completed as to labor & FOH. Labor & FOH charged to the department are $37,310 & $32,800 respectively.

Required: Prepare the cost of production report for Assembly department

ABC Company

Assembly Department

Cost of production report

For the month ended: November 2013

Quantity Schedule

Units received from preceding department …… 45,000

Units transferred to the next department ……40,000

Units still in process (1/3 labor & FOH) ……. 3,000

Units lost in process …….	2,000	45,000

Costs Charged to the department

	Total cost	units cost
Costs from the preceding department:		
Transferred in during the month (45,000 units)	$77,400	$1.72
Cost added by the department:		
Labor ……	$37,310	$0.91
FOH …….	32,800	0.80
Total cost added ……..$70,110		$1.71
Adjustment for lost units ……	-	0.08
Total cost to be accounted for	$147,510	$3.51

Cost accounted for as follows

- Transferred to next department (40,000 x $3.51) ……	$140,400	
Work in process ending inventory:		
- Adjusted cost from the preceding department		
(3,000 x ($1.72+$0.08) ……..……	$5,400	
- Labor (3,000 x 1/3 x $0.91) ……..……	910	
- FOH (3,000x 1/3 x $0.08) ……..……..	800	7,110
Total cost accounted for ……		$147,510

Additional computations

Equivalent units of production:

$$\text{Labor \& FOH } 40{,}000 + \frac{3{,}000}{3} = \underline{\underline{41{,}000}}\ \textit{units}$$

Unit cost:

$$\text{Labor} = \frac{\$\ 37{,}310}{41{,}000} = \$0.91/\ \textit{unit}$$

$$\text{FOH} = \frac{\$32{,}800}{41{,}000} = \$0.80/\textit{unit}$$

Adjustment for lost units

Method No.1- $\frac{\$77{,}400}{43{,}000} = \$1.80,\quad \$1.80 - \$1.72 = \$0.08/\textit{unit}$

Method No. 2- 2,000 units x \$1.72 = \$3,440, $\frac{\$3{,}440}{43{,}000} = \$0.08/\textit{unit}$

Units lost in department subsequent to the first – The cutting department's unit cost was \$1.72 when 45,000 units were transferred to the assembly department. However, because 2,000 of 45,000 units were lost during processing in the assembly department the \$1.72 unit cost figure will no longer be applied & must be adjusted accordingly. The total cost of the units transferred remains \$77,400. But 43,000 units must now absorb this total cost, causing an increase of \$0.08 in the cost per unit due to the loss of 2,000 units in the cutting department.

The lost units cost can be computed by one of the following two methods.

Method 1 here we determine a new unit cost for work done in the preceding department and subtracts the preceding department's old unit cost from the adjusted unit cost figure. The difference between the two figures is the additional cost due to lost units.

Method 2 The lost units' share on the total cost will be determined and will be allocated to the remaining good units. Total cost previously absorbed by the units lost, is \$3,440, (2,000 unit x

$1.72) must be absorbed by the remaining good units. The lost unit cost adjustment must be entered in the cost of production report on the adjustment for lost units' line.

Timing of lost units: lost units may occur at the beginning, during or at the end of a process. For purpose of practicality and simplicity, it is ordinary assumed that units lost at the beginning or during process were never put in process. Therefore, the cost of units lost is spread over the **units completed** and **units still in process.**

When units are lost or are identified as lost at the end of a process, the cost of lost units is charged to **completed units only**. For example, if the 2,000 units lost from assembly department were occurred at the end of process, the cost of production report would look like the following:

ABC Company

Assembly Department

Cost of production report

For the month ended: November 2013

Quantity Schedule

Units received from preceding department ……..		45,000
Units transferred to the next department …….	40,000	
Units still in process (1/3 labor & FOH) …….	3,000	
Units lost in process ……	2,000	45,000

Costs Charged to the department

	Total cost	units cost
Costs from the preceding department:		
Transferred in during the month (45,000 units)	$77,400	$1.72

Cost added by the department:

Labor ……	$37,310	$0.87
FOH ……	32,800	0.76
Total cost added ……	$70,110	$1.63
Total cost to be accounted for	$147,510	$3.35

Cost Accounted for As follows

Transferred to next department

(40,000 x $3.5175(3.35+0.1675))* …… $140,720

Work in process ending inventory:

Adjusted cost from the preceding department

(3,000 x ($1.72) ……..……	$5,160	
Labor (3,000 x 1/3 x $0.87) ……	870	
FOH (3,000x 1/3 x $0.76) ……..	760	6,790
Total cost accounted for ……		$147,510

Additional computation

Equivalent units of production

$$\text{Labor \& FOH} = 40{,}000 + \frac{3000}{3} + 2{,}000 = \underline{\underline{43{,}000\ units}}$$

Unit cost: labor $= \dfrac{\$37{,}310}{43{,}000} = \underline{\underline{\$0.87}}/unit$

$$\text{FOH} = \frac{\$32{,}800}{43{,}000} = \underline{\underline{\$0.76}}/unit$$

Lost unit cost = 2,000 x $3.35 = $6,700

$= \frac{\$6{,}700}{40{,}000}$ $\underline{\underline{\$0.1675}}/unit$ to be added to $ 3.35 to make the transfer cost = $\underline{3.5175}$

** 40,000 units X $3.5175 = $140,700. To avoid a decimal discrepancy, the cost transferred is computed: $147,510 - $6,790 = $140,720.*

Normal Vs Abnormal loss of units

Units lost through evaporation, shrinkage, substandard yields, spoiled work, or inefficient equipment. In many instances the nature of operation makes certain losses normal or unavoidable, because they are considered within normal tolerance limits of human & machine errors. The cost of these normally lost units does not appear as a separate item of cost, but is spread over the remaining good units.

A different situation is created by abnormal or avoidable spoilage or losses that are not expected to arise under normal efficient operating conditions. The cost of such abnormal spoilage or losses is charged either to FOH, or directly to the current period expense account and reported as a separate item in the cost of goods sold statement.

FOH control ---------- 6,700

Lost units 6,700

WIP – assembly dept. ---------- 6,700

The cost of production report would show the abnormal spoilage or loss as follows:

*- Transferred to the next department (40,000 units x $3.35) $134,020**

- Transferred to FOH [(40,000 x $0.1675) or (2,000 x$3.35) *6,700*

** 40,000 units X $3.35 = $134,000. To avoid decimal Discrepancy, the cost transferred is computed: $147,510 - $6,790 ending inventory - $6,700 = $134,020.*

If the Lost units were only partially complete, equivalent units of production calculation should consider their stage of completion when lost or spoiled, and the costing of the abnormal loss should be weighted accordingly. If one part of loss is normal and another part abnormal, each portion must be treated in accordance with the above discussion.

Cost of Production report for Third (Finishing) department

The total & unit cost of the cost of production report of the finishing (third) department were derived by using procedures discussed for the cost of production report of the assembly department. The work completed is transferred to the finished goods store room; thus the title **«Transferred to finished goods store room»** is used in place of the title **"Transferred to next department».** The journal entry to be maintained by finishing department for costs transferred from assembly department is as follow.

WIP- Finishing department …….140, 400

WIP – Assembly department ……. 140,400

Example

Among the 40,000 units transferred from the assembly department 35,000 units are transferred to Finished Goods storeroom; 4,000 units still in process and 1,000 units are lost during production. Ending WIP-balance is ¼th completed as to labor & FOH. Besides the labor & FOH balances charged to the process in this department are $32,400 & 19,800 respectively.

Required prepare a cost production report for Finishing department

ABC Company

Terminal department

Cost of production report

For the month ended November,2013

Quantity schedule

- Units received from preceding department …….40, 000

- Units transferred to FG storeroom ……. …35,000

- Units still in process (1/4-labor & FOH) …… 4,000

- Units lost in process …… 1, 000 40,000

Costs charged to the department	**Total cost**	**Unit cost**
Cost from preceding department:		
Transferred **in** during the month		
(40,000 units)	$140,400	$3.51
Costs added by the department		
Labor	32,400	$0.90
FOH	19,800	0.55
Total cost added	$52,200	$1.45
Adjustment for lost units	__	0.09
Total cost to be accounted for	$192,600	$5.05

Costs accounted for as follows

- Transferred to FG storeroom (35,000x$5.05) $176,750

- **WIP-ending inventory:**

Adjusted cost from preceding department

(4,000 x ($3.51 +0.09)) …… 14,400

Labor (4,000x1/4 x$0.90) …….. 900

FOH (4,000 x ¼ x $0.55) …… 550 15,850

Total cost accounted for …..... _ $192,600

Additional computations

Equivalent units of production

Labor & FOH = 35,000 + (1/4 x 4,000) = 36,000 units

Unit cost:

$$\text{Labor} = \frac{\$32{,}400}{36{,}000} = \$0.90/unit$$

$$\text{FOH} = \frac{\$19{,}800}{36{,}000} = \$0.55/unit$$

Adjustment for Lost units:

Method 1: $\frac{\$\,140{,}400}{39{,}000} = \$3.60, \quad \$3.60 - 3.51 = \$0.09/unit$

Method 2: 1,000 units x \$3.51= \$3.510 $\frac{\$3{,}510}{39{,}000} = \$0.09/unit$

The entry to transfer the finished units into the FG Storeroom is:

FG ……..……. 176,750

WIP – Finishing Department ……..… 176,750

Additions of Materials in Subsequent Departments

In numerous industries, all materials needed for the product are put in process in the first department. However, additional materials might be required in subsequent departments in order to complete the units. The addition of such materials has two possible effects **on units** and **costs in process.**

The additional materials **increase the unit cost**, since these materials become a part of the product manufactured, but **do not increase** the number of **final units.** For example, in an automobile assembly plant additional parts, these materials are needed to give the product certain specified quantities, characteristics, or completeness.

The added materials increase the number of units and also cause a change in unit cost. In processing chemical, water is often added to a mixture, causing an increase in the number of units and a spreading of costs over a greater number of units.

Increase in units cost due to addition of materials: In the simplest case, added materials such as parts of an automobile **do not increase** the **number of units but increase total cost and unit costs**. A materials unit cost must be computed for the department, and a materials cost must be included in the work in process inventory.

Example

Assume the additional materials costing $ 17,020 are placed in process and charged to the Terminal department. Assume further that the materials in work in process are sufficient to complete 2,000 of the 4,000 units; that is, units are 50% complete as to materials cost. The effect of the additional materials cost is shown in the cost report be below.

ABC COMPANY

Terminal Department

Cost of production Report

For the month of November,2013

Quantity Schedule;

Units received from preceding department	40,000	
Units transferred to finished goods store room	35,000	
Units still in process (½ materials, ¼ labor and factory overhead)	4,000	
Units lost in process	1,000	= 40,000

Cost charged to the Department:

Cost from preceding department	**Total cost**	**unit cost**
Transferred in during the month (40,000 units)	$140,400	$3.51

Cost added by department:

Materials	$17,020	$0.46
Labor	32,400	0.90
Factory overhead	19,800	0.55
Total cost added	$69,220	$1.91
Adjustment for lost units	-	0.09
Total cost to be accounted for	$209,620	$5.51

Cost accounted for as follows:

Transferred to finished goods storeroom (35,000x$5.51)	$192,850		
Work in process ending inventory:			
Adjusted cost from preceding department (4,000x$3.60)	$14,400		
Materials (4,000 x 1/2 x $0.46)	920		
Labor (4,000 x ¼ x $ 0.90)	900		
Factory overhead (4000 x ¼ x $0.55)	550	=	16,770
Total cost accounted for			$209,620

Additional computations:

Equivalent units of production:

Materials = 35,000 + 4000 ÷ 2 = 37,000 units

Labor and factory overhead = 35,000 + 4000 ÷ 4 = 36,000 units

Unit costs:

Materials = $ 17,020 ÷ 37,000 = $0.46 per unit

Labor = $32,400 ÷ 36,000 = $0.90 per unit

Factory overhead = $19,800 ÷ 36,000 = $0.55 per unit

Adjustment for lost units:

Method No. 1 = $140,400 ÷ 39,000 = $3.60; $3.60 - $3.51 = $0.09 per unit

Method No. 2 = 1,000 units x$3.51=$3,510, $3,510 ÷ 39,000=$0.09 per unit

The only differences in the two cost reports (the report for the third department(Terminal) and the above report) are the $17,020 materials cost charged to the department and $0.46 materials unit cost ($17,020 / 37,000). The additional materials cost is also reflected in the total cost to be accounted for and in the ending work in process inventory.

Increase in units and change in unit cost Due to Addition of Materials

When additional materials result in additional units different computations are necessary. The greater numbers of units cause a decrease in unit cost which necessitates an adjustment of the preceding department's unit cost; since the increased number of units will absorb the same total cost transferred from preceding department.

Example: Assume Terminal department costs for labor and factory overhead of $32,400 and $19,800 respectively, an additional materials cost of $17,020 and an increase of 8,000 units as the result of added materials.

Required: - Prepare the cost of production report for Terminal Department

ABC COMPANY

Terminal Department

Cost of Production Report

For the Month of November,2013

Quantity Schedule:

Units received from preceding department	40,000	
Additional units put into process	8,000	48,000
Units transferred to finished goods storeroom	44,000	
Units still in process (1/2 materials, ¼ labor and factory overhead)	4,000	48,000

Cost charged to the department:

Cost from preceding department	**Total cost**	**unit cost**
Transferred in during the month (40,000 units)	$140,400	$3.510

Cost added by department:

Materials	$17,020	$0.370
Labor	32,400	0.720
Factory overhead	19,800	0.440
Total cost added	$69,220	$1.530
Adjusted unit cost of units transferred in during the month	_-__	2.925
Total cost to be accounted for	$209,620	$4.455

Cost Accounted for as Follows:

Transferred to finished goods Storeroom (44,000 x $4.455)		$196,020

Work in process – ending inventory:

Adjusted cost from preceding department (4,000x$2.925)	$11,700	
Materials (4,000 x 1/2 x $0.370)	740	
Labor (4,000 x ¼ x $0.720	720	
Factory overhead (4,000 x ¼ x $0.440)	440	13,600

Total cost Accounted for $209,620

Additional Computations:

Equivalent units of production:

Materials = 44,000 + 4000 ÷ 2 = 46,000 units

Labor and factory overhead = 44,000 + 4,000 ÷ 4 = 45,000 units

Unit costs:

Materials = $17,020 ÷ 46,000 = $0.370 per unit

Labor = $32,400 ÷ 45,000 = $0.720 per unit

Factory overhead = $19,800 ÷ 45,000 = $0.440 per unit

Adjustment for additional units = $140,400 ÷ 48,000 = $2.925 per unit

PROCESS COSTING: AVERAGE AND FIFO COSTING

Beginning Work in Process Inventories

The cost of production reports illustrated in previous **cost of production reports** listed ending work in process inventories. These inventories become beginning inventories of the next period. Two of the possible methods of accounting for these beginning inventory costs are:

1. Average Costing -Beginning inventory costs are added to the costs of the new period
2. First-In First-Out (FIFO) Costing -Beginning inventory costs are kept separate from the new costs necessary to complete the work in process inventory

Average Costing

The average costing method of accounting for beginning work in process inventory costs involves merging these costs with the cost of the new period. To accomplish this relatively simple task, representative average unit costs must be determined.

The December cost reports of the three departments' reviewed **in the preceding discussion** are used to illustrate the treatment of beginning work in process inventory and to show the relationship of costs from one period to the next. Ending inventories in November departmental cost reports become beginning work in process inventories for November and are summarized as follows:

	Cutting	**Assembly**	**Finishing**
Units ……	4,000	3,000	4,000
Cost from preceding			
Department ……	-	$5,400	$14,400
Materials in process……	$2,000	-	-
Labor in process ……	1,240	910	900
Factory overhead in			
Process……	1,200	800	550

Example of Cutting Department: The December 1 work in process inventory of the cutting Department shows a $2,000 materials cost, a $1,240 labor cost, a $1,200 factory overhead cost, and 4,000 units in process. During December, additional charges to the department are material, $19,840; labor, $24,180; and factory overhead, $22,580. The additional materials put into process are for the production of 40,000 units. Therefore, **units to be accounted for** total 44,000 (4,000 + 40,000). Of the total units put into process, 39,000 are completed with 38,000 units transferred to the Assembly Department and 1,000 units awaiting for transfer. At month end

3,000 units are in process, 100 percent complete as to materials but only 66.66 (2/3) percent complete as to labor and overhead. During the month, 2,000 units were lost.

In the cutting Department as well as in the subsequent departments in this illustration, it is assumed that the loss applies to all good units and that the loss is within normal tolerance limits. Therefore, the effect of the losing units is an increase in the unit cost of the remaining good units.

The unit cost of work done in the cutting Department is $1.72 consisting of $0.52 for materials, $0.62 for labor, and $0.58 for factory overhead. The $0.52 unit cost for materials is computed by adding the materials cost in the beginning work in process inventory to the materials cost for the month ($2,000+$19,840) and dividing the $21,840 total by the equivalent production figure of 42,000 units. These units include the 38,000 units completed and transferred, the 1,000 units completed but still on hand and the 3,000 units in process, which are completed as to materials. The cost of materials already in process is added to the materials cost for the month before dividing by the equivalent production figure. This method results in an **average unit cost** for work done in the current and preceding periods.

The same procedure is followed in computing unit costs for labor and factory overhead. The $0.62 unit cost for labor is a result of dividing equivalent production of 41,000 units [39,000+ (2/3 X 3,000)] into the sum of the beginning inventory labor cost of $1,240 and the departmental labor cost of $24,180 for the month. The factory overhead unit cost is $0.58 [($1,200+$22,580)/41,000].

The cost remaining in the Assembly Department, $5,680, is assigned to the ending work in process inventory. The WIP inventory consists of $1,720 (1,000 units x $1.72) for units completed and on hand and of the following costs assigned to units still in process $1,560 (3,000 units x $0.52) for materials; $1,240 (2,000 units x $0.62) labor; and $1,160 (2,000 units x $0.58) for factory overhead. The 1,000 units completed but on hand are listed as work in process in the cutting department as this department is still responsible for these units.

ABC Company

Cutting Department

Cost of production Report Average costing

For the month of Nov,2013

Quantity schedule:

Units in process at beginning (all materials,		
½ labor and factory overhead)	4,000	
Units started in process	40,000	44,000
Units transferred to next department	38,000	
Units completed and on hand	1,000	
Units still in process (all materials, 2/3 labor		
and factory overhead)	3,000	
Units lost in process	2,000	44,000

Cost charged to the department:

Cost added by department:	**Total cost**	**unit cost**
Work in process-beginning inventory:		
Materials	$2,000	
Labor	1,240	
Factory overhead	1,200	
Cost added during the period:		
Materials	19,840	$0.52
Labor	24,180	0.62

Factory overhead	22,580	0.58
Total cost to be accounted for	$71,040	$1.72

Cost accounted for as follows:

Transferred to next department (38,000x$1.72)		$65,360	
Work in process-ending inventory:			
Completed and on hand (1,000x$1.72)	$1,720		
Materials (3,000x$0.52)	1,560		
Labor (3,000 x 2/3 x $0.62)	1,240		
Factory overhead (3,000 x 2/3 x $0.58)	1,160	5,680	
Total cost Accounted for			$71,040

Additional computations:

Equivalent units of production:

Materials =38,000 + 1,000 + 3,000 = 42,000 units

Labor and factory overhead = 38,000 + 1,000+ (2/3 x 3000) = 41,000 units

Unit costs:

Materials = $2,000 + $19,840 = $ 21,840, $21,840 ÷42,000 = $0.52 per unit

Labor = $1,240 +$24,180= $25,420, $25,420÷41,000 = $0.62 per unit

Factory overhead = $1,200 + $22,580 = $23,780, $23,780 ÷41,000 = $0.58 per unit

Of total cost charged to the department, $65,360 is transferred to the Assembly Department when the following entry is recorder:

Work in process-Assembly Department ……. 65, 360

Work In process- cutting Department…… 65,360

Assembly Department, Accounting for the beginning work in process inventory cost in a department other than the first requires additional analysis. When the prior period's ending work in process inventory was computed, part of the cost of this inventory came from costs added by the preceding department. Because costs assigned to the beginning work in process inventory are added to costs incurred during the period and the total is divided by equivalent production, the beginning work in process inventory of departments other than the first must be split into following two parts:

1. cost transferred from preceding departments
2. Cost added by the department itself.

The portion of the beginning work in process inventory cost from preceding department is entered in the section of the cost report entitled **"Cost from preceding department."** It is added to the costs of transfers received from the preceding department during the current period. An average unit cost for done in preceding departments is then computed. The other portion of the beginning inventory cost, which was added by the Assembly Department, is entered as a departmental cost to be added to other departmental costs incurred during the current period. Average unit costs are then computed.

Example of assembling department: The analysis of the beginning work in process inventory of this department list 3,000 units in process with cost of $5,400 from the preceding department, a labor cost of $910, and $800 for factory overhead with their per unit cost. The following costs pertain to December : cost from the preceding department is labor, $34,050; factory overhead, $30,018. Units completed and transferred to the Finishing Department totaled 36,000; 4,000 units are in process, 50 percent complete as to labor and factory overhead 1,000 units were lost in process.

 # prepare cost of production report for assembling department.

ABC Company

Assembly Department

Cost of Production Report Average Costing

For the Month of December, 2013

Quantity Schedule:

Units in process at beginning (1/2 labor and Factory overhead)	3,000	
Units received from preceding department	38,000	41,000
Units transferred to next department	36,000	
Units still in process (½ labor and Factory overhead)	4,000	
Units lost in process	1,000	41,000

Cost charged to the Department:

Cost from preceding department:	**Total cost**	**unit cost**
Work in process-beginning inventory (3,000 units)	$5,400	$1.800
Transferred in during this period (38,000 units)	65,360	1.720
Total (41,000 units)	$70,760	$1.726

Cost added by department:

Work in process-beginning inventory:

Labor	$910
Factory overhead	800

Cost added during the period:

Labor	34,050	$0.920
Factory overhead	30,018	0.811
Total cost added	$65,778	$1.731
Adjustment for lost units		0.043
Total cost to be accounted for	$136,538	$3.500

Cost Accounted for As follows:

Transferred to next department (36,000x$3.500)		$126,000
Work in process-ending inventory:		
Adjusted cost from preceding department		
(4,000x ($1.726+$0.043)	$7,076	
Labor (4,000 x ½ x $ 0.920)	1,840	
Factory overhead (4,000x ½ x $ 0.811)	1,622	10,538
Total cost accounted for		$136,538

Additional Computations:

Unit cost from preceding department =$70,760= $1.726 per unit

41,000

Equivalent units of production:

Labor and factory overhead: 36,000 + 4000 ÷ 2= 38,000 units

Unit costs:

Labor =$910 + $34,050=$34,960; $34,960 ÷ 38,000 =$0.920 per unit

Factory overhead= $800 + $30,018 = $30,818; $30,818 ÷ 38,000=$0.811 per unit

Adjustment for lost units:

Method No. 1: $70,760= $1.769; $1.769 - $1.726=$0.043 per unit

40,000

Method No.2: 1,000units x $1.726=$1,726; $1,726 ÷ 40,000= $0.043 per unit

The following entry transfers the cost of the 36,000 units to the next department:

Work in process-Finishing Department …… $126,000

Work in process- Assembly Department…… $126,000

Finishing Department: The accounting treatment for the Finishing Department is similar to that of the Assembly department except that the Finishing department is the last department in ABC Co. and it transfers all of its products to the Finished Goods storeroom.

To complete this discussion of operation for December , the cost of production report of the Finishing department is prepared on the basis of the following data: costs added by the department during the month are labor, $33,140 and factory overhead, $19,430. The units are accounted for as follows: completed and transferred to finished goods, 36,000 units; 3,000 units are still in process 1/3 labor and factory overhead 1,000 units are lost in process with all cost receive from previous department and period..

ABC COMPANY

Terminal Department

Cost of Production Report – Average costing

For the Month of December 2013

Quantity Schedule:

Units in process at beginning (¼ labor and Factory overhead)	4,000	
Units received from preceding department	36,000	40,000
Units transferred to finished goods store room	36,000	
Units still in process (1/3 labor and factory overhead)	3,000	
Units lost in process	1,000	40,000

Cost charged to the Department:

Cost from preceding department:		**Total cost**	**unit cost**
Work in process-beginning inventory (4,000 units)		$14,400	$3.60
Transferred in during this period	(36,000 units)	126,000	3.50
Total	(40,000 units)	$140,400	$3.51

Cost added by the Department*:*

Work in process beginning inventory:		
Labor	$900	
Factory overhead	550	

Cost added during the period:

Labor	33,140	$0.92
Factory overhead	19,430	0.54
Total cost added	$54,020	$1.46
Adjustment for lost units	_	0.09

Total cost to be accounted for	$194,420	$5.06

Cost accounted for as follows:

Transferred to finished goods store room (36,000x$5.06)	$182,160
Work in process-ending inventory:	
Adjusted cost from preceding department	
(3,000x ($3.51+0.09)	$10,800
Labor (3000x 1/3 x$0.92)	920
Factory overhead (3,000x1/3x$0.54)	540
12,260	

Total cost accounted for	$194,420

Additional Computations:

Unit cost from preceding department = $140,400 ÷ 40,000= $3.51 per unit

Equivalent units of production:

Labor and factory overhead=36,000+3000 ÷ 3= 37,000 units

Unit costs:

Labor=$900+$33,140=$34,040; $34,040 ÷ 37,000= $0.92 per unit

Factory overhead=$550+$19,430=$19,980; $19,980 ÷ 37,000= $0.54 per unit

Adjustment for lost units:

Method No.1: $140,400 ÷ 39,000 =$3.60; $3.60-$3.51= $0.09 per unit

Method No.2: 1000x$3.51=$3,510; $3,510 ÷ 39,000= $0.09 per unit

The following entry transfers the cost of the 36,000 finished units to finished goods.

Finished Good ……182,160

Work in process- Finishing Department ……182,160

First-In First-Out (FIFO) Costing

The First In First Out method may be used to account for beginning work in process inventory costs in process costing. Under this method, the beginning works in process inventory costs are separated from cost incurred in the current period and are not average with the additional new costs. This procedure gives one unit cost for units completed from the beginning work in process inventory and another for units started and finished in the same period. The cost of completed units for beginning WIP is computed, first followed by the computation of the cost of units started and finished within the period.

To illustrate the FIFO method, the November cost of production reports for ABC Company are presented, using the same data and assumptions as were used in the average costing illustration. A comparison of these reports with those illustrated for the average costing method indicates that the two methods do not result in significantly different unit costs, since in general, manufacturing operations in process cost type industries are more or less uniform from period to period.

Cutting Department: When the November cost of production report of the Cutting Department using the FIFO method is compared to the average costing report, the following difference are apparent;

1. Under FIFO costing, the beginning work in process inventory cost of $4,440 is kept separate and is not broken down into its component parts.
2. Under FIFO costing, the degree of completion of the beginning work in process inventory must be stated in order to compute completed unit costs.

Example: consider the example given above on weighted average costing and prepare cost of production report for cutting department by using FIFO costing system.

ABC Company

Cutting Department

Cost of Production Report – FIFO Costing

For the Month of December 2013

Quantity Schedule:

Units in process at beginning (all materials, ½Labor and factory overhead)	4,000	
Units started in process	40,000	44,000
Units transferred to next department	38,000	
Units completed and on hand	1,000	
Units still in process (all materials, 2/3 labor and Factory overhead)	3,000	
Units lost in process	2,000	44,000

Cost charged to the Department:	**Total cost**	**unit cost**
Work in process-beginning inventory	$4,440	
Cost added by the department:-		
Materials	$19,840	$0.522
Labor	24,180	0.620
Factory overhead	22,580	0.579
Total cost added	$66,600	1.721
Total cost to be accounted for	$71,040	

Cost accounted for as follows:

Transferred to next department:

From beginning inventory:

Inventory cost	$4,440	
Labor added (4,000x1/2x$0.620)	1,240	
Factory overhead added (4,000x1/2x$0.579)	1,158	6,838[b]

From current production:

Units started and finished (34,000x$1.721)	58,517*	$65,355

Work in process-ending inventory:

Completed and on hand (1,000 x $1.721)	$1,721	
Materials (3,000 x $0.522)	1,566	
Labor (3,000 x2/3 x $0.620)	1,240	
Factory overhead (3,000 x 2/3 x $0.579)	1,158	5,685[c]
Total cost accounted for		$71,040[a]

*34,000 units x $1.721 per unit=$58,514 to avoid a decimal discrepancy, the cost transferred from current production is computed as follows.

$71,040-($6,838+$5,685) = $58,517 $\left[a-(b+c)\right]$

Additional computation:		**Labor and factory**
Equivalent production	**Materials**	**over head**
Transferred out	38,000	38,000
Less: beginning inventory (all units)	4,000	4,000
Started and finished this period	34,000	34,000
Add: beginning inventory (Worked in this period)	0	2,000

Add: ending inventory:

Completed and on hand	1,000	1,000
Still in process (worked in this period)	3,000	2,000
	38,000 units	***39,000 units***

Unit cost: Materials = $19,840 = $0.522 per unit
38,000

Labor = $24,180 = $0.620 per unit
39,000

Factory overhead = $22,580 = $0.579 per unit
39,000

The following entry transfer the total cost of the 38,000 units sent to the next department.

Work in process –Assembly Department……65,355

Work in process- Cutting Department……65,355

Assembly Department:

ABC COMPANY

Assembly Department

Cost of Production Report – FIFO Costing

For the Month of December 2013

Quantity Schedule:

Units in process at beginning (1/3 labor and factory overhead)	3,000

Units received from preceding department	38,000	41,000
Units transferred to next department	36,000	
Units still in process (1/2 labor and factory overhead)	4,000	
Units lost in process	1,000	41,000
Cost charged to the Department:	**Total cost**	**unit cost**
Work in process-beginning inventory		
Cost from preceding department:	$7,110	
Transferred in during the month (38,000 units)	$65,355	$1.720
Cost added by department		
Labor	$34,050	$0.920
Factory overhead	30,018	0.811
Total cost added	$64,068	$1.731
Adjustment for lost units		0.046
Total cost to be accounted for	$136,533	$3.497
Cost accounted for as follows:		
Transferred to next department		
From beginning inventory:		
Inventory cost	$7,110	
Labor added (3,000x2/3x$0.920)	1,840	
Factory overhead added (3,000x2/3x$0.811)	1,622	$10,572
From current production:		

Units started and finished (33,000x$3.497)	115,435*	$126,007
Work in process-ending inventory:		
Adjusted cost from preceding department		
(4,000x ($1.72+$0.046)	$7,064	
Labor (4,000x1/2x$0.920)	1,840	
Factory overhead (4,000 x 1/2 x $0.811)	1,622	10,526
Total cost accounted for		$136,533

*33,000 units x $3.497 = $115,401. To avoid a decimal discrepancy, the cost transferred from current production is computed as follows.

$136,533 – ($10,572 + $10,526) = $115,435

Additional computation

Equivalent production	**Labor and factory overhead**
Transferred out	36,000
Less: beginning inventory (all units)	3,000
Stared and finished in this period	33,000
Add: beginning inventory-(Work this period)	2,000
Add: ending inventory	2,000
	37,000 units

Units cost:

Labor = $\underline{\$34,050}$ = $\underline{\$0.920}$ per unit, Factory overhead = $\underline{\$30,018}$ = $\underline{\$0.811}$ per unit

37,000 37,000

Adjustment for lost units:

Method No.1 = $\underline{\$65,355}$ = $1.766; $1.766 - $1.720= $\underline{\$0.046}$ per unit

38,000 – 1,000

Method No. 2. =1,000 units x $1.720=$1,720; 1,720 ÷ 37,000 = $\underline{\$0.046}$ per unit

The following entry transfers the cost of the 36,000 units to the next department.

Work In process-Finishing Department……126,007

Work In process- Assembly Department…… 126,007

The remaining $10,526 cost to be accounted for is the ending work in process inventory which is computed in the conventional manner.

Finishing Department: To complete the illustration of FIFO costing, the cost of production report of the Finishing Department is prepared.

ABC Company

Terminal Department

Cost of Production Report – FIFO Costing

For the Month December 2013

Quantity Schedule:

Units in process at beginning (1/4 labor & factory overhead)	4,000	
Units received from preceding department	$\underline{36,000}$	$\underline{40,000}$

Units transferred to finished goods store room		36,000	
Units still in process (1/3 labor & factory overhead)		3,000	
Units lost in process		1,000	40,000
Cost charged to the Department:		**Total cost**	**unit cost**
Work in process-beginning inventory		$15,850	
Cost from preceding department:			
Transferred in during the month (36,000 units)		$126,007	$3.500
Cost added by department:			
Labor		$33,140	$0.921
Factory overhead		19,430	0.540
Total cost added		$52,570	$1.461
Adjustment for lost units		_	0.100
Total cost to be accounted for		$194,427	$5.061
Cost accounted for as follows:			
Transferred to next department			
From beginning inventory:			
Inventory cost	$15,850		
Labor added (4,000x3/4 x $0.921)	2,763		
Factory overhead added (4000x3/4 x$0.540)	1,620	$20,233	
From current production:			
Units started and finished (32,000 x $5.061)	161,933*	$182,166	

Work in process-ending inventory		
Adjusted cost from proceeding		
Department (3,000x ($3.50+$0.10)	$10,800	
Labor (3,000 x 1/3 x$0.92)	921	
Factory overhead (3,000x1/3x$0.540)	540	12,261
Total cost accounted for		$194,427

*32,000 x $ 5.061 per unit = $161,952. To avoid a decimal discrepancy, the total cost transferred from current production is computed as follows. $194,427 – ($20,233 + $12,261) = $161,933

Additional computation:

Equivalent production	**Labor and factory overhead**
Transferred out	36,000
Less: beginning inventory (all units)	4,000
Started and finished this period	32,000
Add: beginning inventory (work this period)	3,000
Add: ending inventory (work this period)	1,000
	36,000 units

Unit costs:

Labor = $33,140= $0.921 per unit

36,000

Factory overhead = $ 19,430 = $0.540 per unit

36,000

Adjustment for lost units:

Method No. 1= $126,007= $3.60; $3.60-$ 3.50= $0.100 per unit

36,000 – 1000

Method No. 2= 1000x$3.50 = $3,500= $3,500= $0.100 per unit

35,000

* 32,000 units X $5.061 = $161,952. To avoid a decimal discrepancy, the cost transferred from current production is computed as follows: $194,427 – ($20,233 + $12,261) = $161,933.

Based on this report, the entry to transfer the cost of the 36,000 finished units is

Finished Goods……182,166

Work in process- Finishing Department…… 182,166

Average Costing Vs FIFO Costing

Both average costing and FIFO costing have certain advantages. It would be arbitrary to state that one method is either simpler or more accurate than the other. The selection of either method depends entirely upon management's opinion regarding the most appropriate and practical lost determination procedures. Each firm should select the method which offers reliable figures for managerial guidance.

The basic difference between the two methods concerns the treatment of beginning work in process inventory. The averaging method adds beginning work in process inventory cost to the cost from the preceding department and to materials, labor, and factory overhead costs incurred during the period. Unit costs are determined by dividing these costs by equivalent production figures. Units cost are transferred to the next department as one cumulative figure.

The FIFO method retains the beginning work in process inventory cost as a separate figure costs necessary to complete the beginning inventory units are added to this cost. The sum of these two cost totals is transferred to the next department. Units started and finished during the period have their own unit cost, which is usually different from the completed unit cost of units in process at the beginning of the period. The FIFO method thus separately identifies for management the current period unit cost originating in a department. Unfortunately, these costs are averaged out in the next department, resulting in a loss of much of the value associated with the use of the FIFO method.

If the FIFO method is used, units lost during a period must be identified as to whether they came from units in process at the beginning or from units started or received during the period. Also in, computing equivalent production figures in FIFO costing the degree of completion of both beginning and ending work in process inventories must be considered.

The principal disadvantage of FIFO costing is that if several unit cost figures are used at the same time, extensive detail is required within the cost of production report, which can lead to complex procedures and even inaccuracy. Whether the extra detail yields more representative unit costs than the average costing method is debatable, especially in a firm where production is continuous and more or less uniform, and appreciable fluctuation in unit costs are not expected to develop. Under such conditions, the average costing methods leads to more satisfactory cost computation.

Difficulties Encountered in Process Cost Accounting Procedures

The following difficulties in using process costing may be encountered in actual practice

1. The determination of production quantities and their stages of completion present problems. Every computation is influenced by these figures. Since the data generally come to the cost department from operating personal often working under circumstances that make a precise count difficult, a certain amount of doubtful counts and reliable estimates are bound to exist. Yet, the data submitted form the basis for the determination of inventory costs.
2. Materials cost computations frequently require careful analysis. In the illustrations, material cost is generally part of the first department's cost. In certain industries,

materials costs are not even entered on production reports. When materials prices are influenced by fluctuating market questions, the materials cost may be recorded in a separate report designs to facilitate management decisions in relation to the materials market.

3. When units are lost shrinkage, spoilage, or evaporation, the time when the loss occurs influences the final cost calculation. Different assumptions concerning the units to which the loss pertains would result in different department unit costs which, in turn, affect inventory costs, the cost of unit transferred, and the completed unit cost. Another consideration involves the treatment of cost attributable to avoidable loss as an expense of the current period. An increase in units resulting from materials added in departments subsequent to the first requires special consideration as well
4. Industries using process cost procedures are generally of the multiple product type. Joint processing cost must be allocated to the products resulting from the processes. Weighted unit averages or other bases are used to prorate the joint costs to the several products. If units manufactured are used as a basis for cost allocation considerable difficulties arise in determining unit costs.

Management must decide whether economy and operational cost are compatible with increased information, based on additional cost computations and procedures. Some companies use both job order and process costing procedures for various purposes in different departments. The basis for using either method should be reliable production and performance data for product costing which, when combined with output, budget, or standard cost data, will provide the foundation for effective cost control and analysis.

Hybrid Costing Systems

Product-costing systems do not always fall neatly into either job-costing or process-costing categories. Consider Ford Motor Company. Automobiles may be manufactured in a continuous flow (suited to process costing), but individual units may be customized with a special combination of engine size, transmission, music system, and so on (which requires job costing). A **hybrid-costing system** blends characteristics from both job-costing and process costing systems. Product-costing systems often must be designed to fit the particular characteristics of different production systems. Many production systems are a hybrid: They have some features of

custom-order manufacturing and other features of mass-production manufacturing. Manufacturers of a relatively wide variety of closely related standardized products (for example, televisions, dishwashers, and washing machines) tend to use hybrid-costing systems.

Overview of Operation-Costing Systems

An **operation** is a standardized method or technique that is performed repetitively, often on different materials, resulting in different finished goods. Multiple operations are usually conducted within a department. For instance, a suit maker may have a cutting operation and a hemming operation within a single department. The term *operation*, however, is often used loosely. It may be a synonym for a department or process. For example, some companies may call their finishing department a finishing process or a finishing operation.

An **operation-costing system** is a hybrid-costing system applied to batches of similar, but not identical, products. Each batch of products is often a variation of a single design, and it proceeds through a sequence of operations. Within each operation, all product units are treated exactly alike, using identical amounts of the operation's resources. A key point in the operation system is that each batch does not necessarily move through the same operations as other batches. Batches are also called **production runs.**

In a company that makes suits, management may select a single basic design for every suit to be made, but depending on specifications, each batch of suits varies somewhat from other batches. Batches may vary with respect to the material used or the type of stitching. Semiconductors, textiles, and shoes are also manufactured in batches and may have similar variations from batch to batch.

An operation-costing system uses work orders that specify the needed direct materials and step-by-step operations. Product costs are compiled for each work order. Direct materials that are unique to different work orders are specifically identified with the appropriate work order, as in job costing. However, each unit is assumed to use an identical amount of conversion costs for a given operation, as in process costing. A single average conversion cost per unit is calculated for each operation, by dividing total conversion costs for that operation by the number of units that pass through it. This average cost is then assigned to each unit passing through the operation. Units that do not pass through an operation are not allocated any costs of that operation.

Illustration of an Operation-Costing System

The Baltimore Clothing Company, a clothing manufacturer, produces two lines of blazers for department stores: those made of wool and those made of polyester. Wool blazers use better-quality materials and undergo more operations than polyester blazers do.

Operations information on work order 423 for 50 wool blazers and work order 424 for 100 polyester blazers is as follows:

	Work Order 423	Work Order 424
Direct materials	Wool	Polyester
	Satin full lining	Rayon partial lining
	Bone buttons	Plastic buttons
Operations		
1. Cutting cloth	Use	Use
2. Checking edges	Use	Do not use
3. Sewing body	Use	Use
4. Checking seams	Use	Do not use
5. Machine sewing of collars and lapels	Do not use	Use
6. Hand sewing of collars and lapels	Use	Do not use

Cost data for these work orders, started and completed in November 2013, are as follows:

	Work Order 423	Work Order 424
Number of blazers	50	100
Direct material costs	$ 6,000	$3,000
Conversion costs allocated:		
Operation 1	580	1,160
Operation 2	400	—
Operation 3	1,900	3,800
Operation 4	500	—
Operation 5	—	875
Operation 6	700	—
Total manufacturing costs	$10,080	$8,835

As in process costing, all product units in any work order are assumed to consume identical amounts of conversion costs of a particular operation. Baltimore's operation-costing system uses a budgeted rate to calculate the conversion costs of each operation. The budgeted rate for Operation 1 (amounts assumed) is as follows:

$$\text{Operation 1 budgeted conversion-cost rate for 2012} = \frac{\text{Operation 1 budgeted conversion costs for 2012}}{\text{Operation 1 budgeted product units for 2012}}$$

$$= \frac{\$232,000}{20,000 \text{ units}}$$

$$= \$11.60 \text{ per unit}$$

Budgeted conversion costs of Operation 1 include labor, power, repairs, supplies, depreciation, and other overhead of this operation. If some units have not been completed (so all units in Operation 1 have not received the same amounts of conversion costs), the conversion-cost rate is computed by dividing budgeted conversion costs by *equivalent units* of conversion costs, as in process costing.

As goods are manufactured, conversion costs are allocated to the work orders processed in Operation 1 by multiplying the $11.60 conversion cost per unit by the number of units processed. Conversion costs of Operation 1 for 50 wool blazers (work order 423) are $11.60 per blazer X 50 blazers = $580, and for 100 polyester blazers (work order 424) are $11.60 per blazer X 100 blazers = $1,160. When equivalent units are used to calculate the conversion-cost rate, costs are allocated to work orders by multiplying conversion cost per equivalent unit by number of equivalent units in the work order. Direct material costs of $6,000 for the 50 wool blazers (work order 423) and $3,000 for the 100 polyester blazers (work order 424) are specifically identified with each order, as in job costing. Remember the basic point in operation costing: Operation unit costs are assumed to be the same regardless of the work order, but direct material costs vary across orders when the materials for each work order vary.

Journal Entries

Actual conversion costs for Operation 1 in November 2013—assumed to be $24,400, including actual costs incurred for work order 423 and work order 424—are entered into a Conversion Costs Control account:

1. Conversion Costs Control	24,400	
Various accounts (such as Wages Payable		

Control and Accumulated Depreciation)		24,400

Summary journal entries for assigning costs to polyester blazers (work order 424) follow. Entries for wool blazers would be similar. Of the $3,000 of direct materials for work order 424, $2,975 is used in Operation 1, and the remaining $25 of materials are used in another operation. The journal entry to record direct materials used for the 100 polyester blazers in November 2013is as follows:

2. Work in Process, Operation 1	2,975	
Materials Inventory Control		2,975

The journal entry to record the allocation of conversion costs to products uses the budgeted rate of $11.60 per blazer times the 100 polyester blazers processed, or $1,160:

3. Work in Process, Operation 1	1,160	
Conversion Costs Allocated		1,160

The journal entry to record the transfer of the 100 polyester blazers (at a cost of $2,975 + $1,160) from Operation 1 to Operation 3 (polyester blazers do not go through Operation 2) is as follows:

4. Work in Process, Operation 3	4,135	
Work in Process, Operation 1		4,135

After posting these entries, the Work in Process, Operation 1, account appears as follows:

Work in Process, Operation 1

(2) Direct materials	2,975	(4) Transferred to Operation 3	4,135
(3) Conversion costs allocated	1,160		
Ending inventory, March 31	0		

Chapter 4

Spoilage, Rework and Scrap

Learning objectives

- Distinguish among spoilage, reworked, and scrap
- Illustrate costing procedures for scrap, spoiled goods and Reworked units Specific job.
- Account for spoilage in process costing using the first –in –first out (FIFO) method and weighted average method.
- Account for spoilage in job costing
- Account for rework in job costing
- Account for scrap

7.1 Introduction

This chapter discusses the topic of accounting for manufacturing defect in the manufacturing process are spoilages for and scrap companies develop accounting techniques for identifying and quantifying the cost of manufacturing defect in order to properly reload and report the value of inventory cost of goods sold, and to develop and analyze proposed or implemented cost-reduction and quality management strategies

7.2 Distinction among spoilage, rework, and scrap

Three categories of cost that result from defects in the manufacturing process are: spoilage, rework, and scrap the term spoilage refers to unit that do not meet the required production specifications. Spoiled units would typically be recycled or sold as seconds. The term rework also refers to units that do not meet the required production specifications, but rework unit are being repaired (reworked) so that they can be sold as normal finished units. The term scrap refers to left –over or residual materials that results from the manufacturing process.

Activities 7.1 distinguish among spoilage, reworked units, and scrap.

7.3 Accounting procedures for normal and abnormal spoilage

A key element of accounting for spoilage is distinguishing between normal and abnormal spoilage. Normal spoilage is spoilage inherent in a particular production process also referred to expected spoilage, and arises even under efficient operating conditions. Cost of normal spoilage are typically treated as a component of the costs good units manufactured because good units cannot be made without the simultaneous appearance of spoiled units

In contrast abnormal spoilage is unusual and unexpected spoilage that should not occur under normal operating conditions. It is not an inherent result of the particular production process and is usually regarded as avoidable and controllable. Abnormal spoilage costs are written off as losses of the accounting period in which detection of the spoiled units occurs.

The questions to ask to account for spoilage are as follows

1) What is the flow of the process (FIFO or weighted average)?
2) Where are the quality control inspection points? It is assumed that all spoilage occurs at the inspection point.
3) How much spoilage is considered "normal"? All spoiled units are the same? , what makes one" normal" and one "abnormal" is a function of acceptable or expected levels of occurrence-A company may determine that from a particular production process three spoiled units should occur.

Spoiled Units are detected, then there are three normal and two abnormal' spoiled units, if only spoiled units are detected, then both are considered to be normal spoilage

Allocation of Normal and Abnormal Spoilage Costs:

Department	**Good Units of product o**r

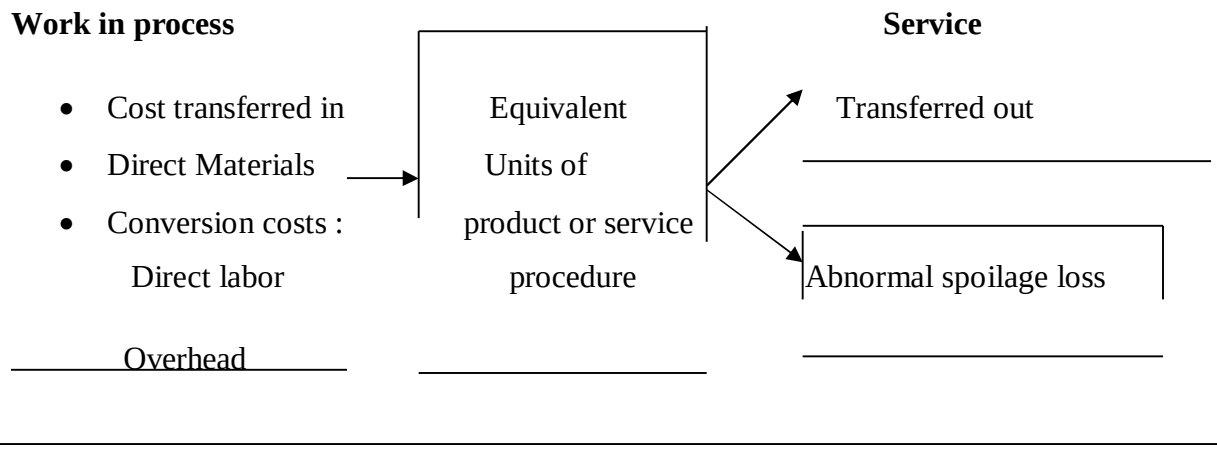


Fig. 7.1 ***Allocation of Normal and Abnormal Spoilage Costs:***

7.3.1 Spoiled Materials charged to total production

The **Waa Mara** products company has monthly capacity to manufacture 125,000 three inch coil springs for use in mechanical brakes production is scheduled in response to orders received. Spoilage is caused by a variety of unpredictable factors and average $ 0.05 per spring. During November, 100,000 springs were produced with a materials cost of $0.40 per unit, a labor cost of $0.50 per unit, and factory overhead charged to production at a rate of 150% of the direct labor cost. This rate is based on an estimate that includes $ 0.05 per spring for spoilage. The entry to record work put into production during the month is:

Work in process –materials ----------40,000

Work in process – labor - - - - - - - - - --- 50,000

Work in process – FOH - - - - - - - - - - 75,000

Materials - 40,000

Payroll - - - - - - - - - - - - - - - -- - - - - -- - 50,000

Applied Factory overhead - - - - - - - - - - 75,000

On the last working day of the month the entire day's production of 4,000 units is spoiled due to improper heat treatment however, these units can be sold for $ 0.50 each in the second hand market. To record this normal loss on spoiled goods and the possible resale value, the entry that charges all production during the period with a proportionate share of the spoilage is:

Subsidiary

Spoiled good Record | 2000

Factory overhead control - - - - - - - | 4600

Loss on spoiled goods ---- 4600

Work in process materials - - - - - - - -- - - - - - - - - 1600

Work in process – labor - - - - - - - -- - - - - -- - - - -2000

Work in process FOH - - - - - - - - - - - - -- - - -- -- - - -3000

The materials, labor and factory overhead in the spoiled units reduced by the recovery or sales value of these units ($1600 materials + $2000 labor + $3000 factory overhead - $2000 cost recovery = $4600 spoilage loss) is reallocated or transferred from work-in-process to factory overhead control. Each of the 96,000 good units produced during the month has a charged in cost of $0.05 for spoilage (96,000 x $0.05 = $4,800). The actual spoilage during the period is $4,600.

The good units produced during the week or on the order where spoilage did occur carry a cost of $0.40 for materials,$0.50 for labor ,and $0.75 for overhead because spoilage is charged to all production-not to the lot or order which happens to be in process at the time of spoilage .in other words, the $165,000 monthly production cost less the $6,600 credit resulting from spoiled units leaves $158,400 to be divided by the 96,000 good units manufactured during the month at a cost of $1.65 per good unit. The entry transferring the good units to finished good is:

Finished Goods----------158,400

Work-in process –materials ----------38,400

Work-in-process-labor----------48,000

Work-in-process-factory overhead----------72,000

During the month ,the amounted charged to factory overhead control represent the depreciation, insurance, taxes, indirect materials, and indirect labor actually experienced, along with the $4600 spoilage cost. All production during the month is charged with overhead of $0.75 per unit.

Overhead analysis reveals a $ 200 favorable variance ($4,600 actual minus $ 4,800 applied) attributable to the spoilage units any difference between the price when the inventory was recorded and the price realized at the time of sale would be a plus or minus adjustment to factory overhead control (loss on spoiled goods)

7.3.2 Spoiled materials charged to a particular job.

The **Waa Mara** products company has a contact to manufacture 10,000 heavy duty coil spring for the Turaf- state supply company. This order requires a steel wire that is harder and slightly heavier than stock normally used, but the production process, as well as labor time and overhead factors, is identical with the standard product. Material cost for each of these springs is $0.60. This special order required exacting specification, and normal spoilage is to be charged to the order. The $0.05 per unit spoilage factor is now eliminated from the overhead rate, and 140% of direct labor cost, or $0.70 per unit, is the rate used on this job . the order is put into production the first day of December, and sampling during the first hour of production indicates that eleven units of production are required to secure ten good springs.

Entries to recorded costs placed into production for 11.000 units are:

Work in process – Materials -------- 6,600

Work in process – labor ---------- 5,500

Work in process- FOH ---------- 7,700

Materials -- - ----------6,600

Payroll ----------5,500

Applied Factory overhead ---------- 7,700

One thousand units did not meet specifications and are spoiled but can be sold as second for $0.45 per unit. The entry to record the spoilage is:

Spoiled Goods ----------450

Work in process – Materials ----------150

Work in process – labor ----------125

Work in process – Factory overhead ---------- 175

$ 450 sales recovery = 25%

$ 1,800 costs of 1,000 units

25% $ 600 materials = $ 150

$ 500 Labor = $ 1R5

$ 700 Factory overhead = 175

OR

$$\frac{\$6{,}600 materials}{\$19{,}800\ total\ \ job\ cost} * \$450\ sales\ recovery = \$150$$

$$\frac{\$5{,}500\ Labor}{\$19{,}800\ total\ \ job cost} X\ \$450\ sales\ recovery = \$125$$

$$\frac{\$7{,}700 Factory\ overhead}{\$19{,}800\ total\ \ Job\ cost} X\ 450\ sales\ recovery = \$175$$

The entry transferring the completed order to finished goods would be:

Finished Goods -- 19,350

Work process – Materials - - - - - ---------- 6,450

Work in process – Labor - - - - - - ----------5,375

Work in process – FOH---------- ----7,525

The net result of this treatment is to charge the spoilage loss of $ 1,350 ($ 1800-450 cost recovery) to the 10,000 good units that are delivered at the original contract price. The unit cost of completed spring is $ 1.935 ($19,350 ÷ 10,000 units).

Any difference between the price when the inventory was recorded and the price realized at the time of sale should be an adjustment to work in process, finished goods, or cost of goods sold, depending on the completion status of the particular job order. As an expedient, the difference might be closed to Factory overhead control.

Activity 7.2 "Normal spoilage is planned spoilage." and "costs of abnormal spoilage are lost costs". Discuss.

7.4 Account for Detective work (Reworked units)

Reworked units are unacceptable units of production that are subsequently reworked into good units and sold completed reworked units should be indistinguishable from non – reworked good units.

In manufacturing process, imperfection may arise because of faults in materials, labor, or machines. If the unit can be reprocessed in one or more stages and made into a standard

Salable product, it is often profitable to rework the defective unit.

Two methods of accounting for the added cost to upgrade defective work are appropriate, depending upon circumstances.

1) If the defective work is experienced in regular manufacturing, the additional cost to correct defective units (based on previous experience) is included in the predetermined factory over head and in the resulting factory over head rate. Actual rework cost is charged to Factory over head control.

To illustrate, assume that **Waa Mara** Company has an order for 500 units of a product that has direct production costs of $5 for material and $ 3 for labor, with factory overhead charged to production at 200 % of labor cost. Fifty units are found to be defective and are to be reworked at a total cost of $30 for materials, $60 for Labor, and over head at 200% of direct labor cost. The entries are:

Work in process – Materials - - - - - - - - - - - - ------- 2,500

Work in process – labor - - - - - - - - - - - - - - - - - - --- 1,500

Work in process factory overhead - - - - - - - - - ---- 3,000

Materials - 2,500

Payroll - - - - - - - - - - - - - - - - - -- - - - - - - - - 1,500

Applied factory overhead - - - - - - -- - -- - - - -- 3,000

Factory overhead control - - - - - - - - - - - - - - - - - - - 210

Defective work - - - - - - - - - - - - 210

Materials - 30

Payroll - 60

Applied Factory over head - 120

Finished goods - 7000

Work in process -materials - 2500

Work in process – Labor - 1,500

Work in process - FOH - 5,000

The unit cost of the completed units is $ 14 ($ 7000 ÷ 5000 units)

2. Suppose, however, that the same company received special order for 5000 units with the agreements stating that any defective work is chargeable to the contract. During production, so units are improperly assembled. The total cost to correct these defective units is $ 30 for materials, $60 for labor, and 200% of the direct labor cost for factory overhead. The entries in this case are:

i. Work in process – Materials - - - - - - - - 2500
Work in process – Labor - - - - - - - - - 1,500

Work in process – FOH - - - - - - - - - - 3,000

Materials - 2,500

Payroll - 1,500

Applied factory over head - - - - - - - - - ---- 3,000

ii. Work in process – materials - - - - - - - 30

Work in process - Labor - - - - - - - - 60

Work in process - FOH - - - - - - - - -- 120

Materials - 30

Payroll - 60

Applied Factory over head - - - - - - - - - - - - - - 120

iii. Finished goods - - - - - - - - - - -- 7,210

Work in process – materials - - - - - - - - - - - - - - - - 2,530

Work in process – Labor - - - - - - - - - - - - - - - - 1,560

Work in process – FOH - - - - - - - - - - - - - - - - 3,120

The unit cost in this case is $ 14.42 instead of $ 14. When ever the defective work cost is charged directly to the job, a slight over charge of factory overhead results because of the inclusion of rework cost in the factory over head rate. One remedy /action / to correct this discrepancy would be either to create a new independent over head rate or to separate costs for the special job.

Activity 7.3 the costs of reworking defective units are always charged to the specific jobs where the defects were originally discovered." Do you agree? Explain.

7.5 Costing procedures for scrap and waste

In manufacturing process, waste and scrap result from:

1. the processing of materials,
2. defective and broken parts
3. obsolete stock

4. revisions or abandonment of experimental projects, and
5. worn out or obsolete machinery. This scrap should be collected and placed in storage for sale to scrap dealers. At the time of sale, the following entry may be made :

Cash (or Account Receivable) - - - - - - - - - x xx

Scrap sales /or Factory overhead control / - - - - xxx

The amount realized from the sale of scrap and waste can be treated in two way with respect to the income statement:

1. The amount accumulated in scrap sales may be closed directly to Income summary and shown on the Income statement under other Income.
2. The amount may be credited to FOH control, thus reducing the total factory overhead expense and there by the cost of goods manufactured.

When Scrap is collected from a job or department, the amount realized from the sale of scrap is often treated as a reduction in the materials cost charged to the individual job or product. In this case, the entry to record the sale would be:

Cash (or Account Receivable) - - - - - - xxx

Work in process - - - - - - - - - - - - - - --- - - --- - -xxx

When the quantity and value of scrap material is relatively high .it should be stored in a designated place under the supervision of a storekeeper. A scrap report (as shown below) is generally prepared in duplicate to authorize transfer receipt of the scrap.

Summary of accounting for spoilage, rework, or scrap:

Type of spoilage, rework, or scrap	**Accounting Treatment**
Normal spoilage arising from the requirements of a specific job	Charge to the individual job
Normal spoilage occurring periodically as a regular part of all jobs	Charge to overhead
Abnormal spoilage	Charge to separate loss account
Opportunity cost of spoilage	Not measured
Rework for defect arising from the requirements of a specific job	Charge to individual job
Rework for defect occurring periodically during normal production	Charge to overhead
Rework for abnormal defect	Charge to separate loss account
Sale of scrap	Record at time of production or at time sold If not material: Record as other income
Scrap common to all jobs or difficult to trace to specific job	Credit to overhead
Scrap traced to individual jobs	Credit to individual job

Summary

Spoilage is unacceptable units of production that are discarded or are sold for net disposal proceeds. Reworked units are unacceptable units that are subsequently reworked and sold as acceptable finished goods. Scrap is a product that has minimal sales value compared with the a sales value of the main or joint product(s)

Accounting for spoilage in process costing systems using the weighted-average method is very similar to the weighted –average method discussed in the previous chapter. The only difference is that the normal and abnormal units are treated as additional unit groups for which cost per –equivalent-unit needs to be calculated and costs assigned.

Accounting for spoilage in process costing systems using the First-in, first-out (FIFO) method is very similar to the first-in, first-out (FIFO) method discussed in the previous chapter. The only difference is that the normal and abnormal units are treated as additional unit groups for which cost-per-equivalent-unit needs to be calculated and costs assigned.

Reworked units should be distinguishable form non-reworked good units when completed, and hence the two are assigned the same costs. Normal work can be assigned to a specific job, or if common to all jobs as part of manufacturing overhead. Abnormal rework is written off as a period cost.

Accounting for scrap is similar to the accounting for by-products discussed in chapter 7.companies differ as to both when and how scrap is recognized in the accounting records. Scrap is some times reused as direct materials rather than sold as scrap. Then it should be debited to materials control as a class of direct materials and carried at its estimated net realizable value.

Self test questions

Q1 In Night Star Shop, 5 air craft parts out of a job lot of 500aircraft parts are spoiled. Costs assigned up to the point of inspection are $100 per unit. Night Star calculates these costs on the basis of its inventory costing assumptions-weighted average, FIFO, or Standard costs. We do not, however, emphasize cost flow assumptions in our presentation here .the current disposal price of the spoiled parts is estimated to be $30 per part. When the spoilage is detected, the spoiled goods are inventoried at $30 per unit.

Required:

a) Pass the journal entry to recognize normal spoilage attributable to a specific job.
b) Assume the normal spoilage is common to all jobs & Pass the necessary journal entry to recognize.
c) If the spoilage is abnormal ,the net loss is highlighted to management by charging the loss to an abnormal loss account .what is the journal entry to record this

Q2. Consider the Night Star machine Shop data .assume that the five spoiled parts used in our Night Star machine Shop illustration are reworked.

a) What is the journal entry for the total costs (details of costs assumed) assigned to the five spoiled units before considering rework costs?
b) If the rework is normal but occurs because of the requirements of a specific job, what is the journal entry to record this normal rework attributable to specific job?
c) If the rework is normal and not attributable to any specific job, what is the journal entry to record this normal rework common to all Jobs?
d) If the rework is abnormal, what sir the journal entry to charge abnormal rework to a separate loss account.

Q3.ArbaMinch textile has some spoiled goods that had an assigned cost of $4,000and zero net disposal value.

Required: prepare a journal entry for each of the following conditions under both (a) process costing (Department A) and (b) job costing:

a) Abnormal spoilage of $4,000.
b) Normal spoilage of $4,000 related to general plant operations.
c) Normal spoilage of $4,000 related to specifications of a particular job.

CHAPTER 5

INCOME EFFECT OF ALTERNATIVE PRODUCT COSTING METHODS

Chapter objectives

After completing this u will be able to:

- Define Variable and absorption costing
- Explain Role of various denominator levels in absorption costing
- Adjusting inventories for external reporting

Introduction

The inventory-costing choice determines which manufacturing costs are treated as inventeriable costs. Inventeriable costs are all costs of a product that are regarded as assets when they are incurred and expensed as cost of goods sold when the product is sold. There are three types of inventory costing methods: absorption costing and variable costing.

The denominator-level capacity choice focuses on the cost allocation base used to set budgeted fixed manufacturing cost rates. There are four possible choices of capacity levels: theoretical capacity, practical capacity, normal capacity utilization, and master-budget capacity utilization.

5.1. Variable and Absorption Costing

The two most common methods of costing inventories in manufacturing companies are variable costing and absorption costing.

Variable Costing

Variable costing is a method of inventory costing in which all variable manufacturing costs (direct and indirect) are included as inventeriable costs. All fixed manufacturing costs are excluded from inventeriable costs and are instead treated as costs of the period in which they are incurred. Note that variable costing is a less-than-perfect term to describe this inventory-costing method, because only variable manufacturing costs are inventoried; variable non-manufacturing costs are still treated as period costs and are expensed. Another common term used to describe this method is direct costing. This is also a misnomer because variable costing

considers variable manufacturing overhead (an indirect cost) as inventeriable, while excluding direct marketing costs.

Absorption Costing

Absorption costing is a method of inventory costing in which all variable manufacturing costs and all fixed manufacturing costs are included as inventeriable costs. That is, inventory "absorbs" all manufacturing costs. For example, job costing system is absorption costing.

Under both variable costing and absorption costing, all variable manufacturing costs are inventeriable costs and all nonmanufacturing costs in the value chain (such as research and development and marketing), whether variable or fixed, are period costs and are recorded as expenses when incurred.

Comparing Variable and Absorption Costing

- ✓ Absorption costing is required for external financial reports and for tax reporting.
- ✓ Under absorption costing, product costs include all manufacturing costs:
  - Direct materials.
  - Direct labor.
  - Variable manufacturing overhead.
  - Fixed manufacturing overhead.
- ✓ Under absorption costing, the following costs are treated as period expenses and are excluded from product costs:
  - Variable selling and administrative costs.
  - Fixed selling and administrative costs
- ✓ Variable costing is an alternative for internal management reports.
- ✓ Under variable costing, product costs include only the variable manufacturing costs:
  - Direct materials.
  - Direct labor (unless fixed).
  - Variable manufacturing overhead.
- ✓ Under variable costing, the following costs are treated as period expenses and are excluded from product costs:
  - Fixed manufacturing overhead.

- Variable selling and administrative costs.
- Fixed selling and administrative costs.

For example:

Last year, Nichols, Inc. had sales of 75,000 units and production of 100,000 units. Other information for the year included:

Direct manufacturing labor	$187,500
Variable manufacturing overhead	100,000
Direct materials	150,000
Variable selling expenses	100,000
Fixed administrative expenses	100,000
Fixed manufacturing overhead	200,000

There was no beginning inventory.

Required:

a. Compute the ending finished goods inventory under both absorption and variable costing.
b. Compute the cost of goods sold under both absorption and variable costing.

Solution:

		Absorption	Variable
a.			
	Direct materials	$150,000	$150,000
	Direct manufacturing labor	187,500	187,500
	Variable MOH	100,000	100,000
	Fixed MOH	200,000	0
	Total	$637,500	$437,500
	Unit costs:		
	$637,500/100,000 units	$6.375	
	$437,500/100,000 units		$4.375
	Ending inventory:		
	25,000 units x $6.375	$159,375	
	25,000 units x $4.375		$109,375
b.	Cost of goods sold:		
	75,000 x $6.375	$478,125	
	75,000 x $4.375		$328,125

5.2. Variable vs. Absorption Costing: Operating Income and Income Statements

The distinction between variable costs and fixed costs is central to variable costing, and it is highlighted by the contribution-margin format.

Similarly, the distinction between manufacturing and nonmanufacturing costs is central to absorption costing, and it is highlighted by the gross-margin format. Absorption-costing income statements need not differentiate between variable and fixed costs.

Example: Stassen's management wants to prepare an income statement for 2012 (the fiscal year just ended) to evaluate the performance of the telescope product line. The operating information for the year is as follows:

1		Units
2	Beginning inventory	0
3	Production	8,000
4	Sales	6,000
5	Ending inventory	2,000

Actual price and cost data for 2012 are as follows:

Selling price	$ 1,000
Variable manufacturing cost per unit	
Direct material cost per unit	$ 110
Direct manufacturing labor cost per unit	40
Manufacturing overhead cost per unit	50
Total variable manufacturing cost per unit	$ 200
Variable marketing cost per unit sold	$ 185
Fixed manufacturing costs (all indirect)	$1,080,000
Fixed marketing costs (all indirect)	$1,380,000

For simplicity and to focus on the main ideas, let assume the following about Stassen:

- Stassen incurs manufacturing and marketing costs only. The cost driver for all variable manufacturing costs is units produced; the cost driver for variable marketing costs is units sold. There are no batch-level costs and no product-sustaining costs.
- Work-in-process inventory is zero.
- Based on the preceding information, Stassen's inventoriable costs per unit produced in 2012 under the two inventory costing methods are as follows:

	Variable Costing		Absorption Costing	
Variable manufacturing cost per unit produced:				
Direct materials	$110		$110	
Direct manufacturing labor	40		40	
Manufacturing overhead	50	$200	50	$200
Fixed manufacturing cost per unit produced		—		135
Total inventoriable cost per unit produced		$200		$335

Income statement of 2012 under the two inventory costing methods are as follows:

A	B	C	D	E	F	G
Panel A: VARIABLE COSTING				Panel B: ABSORPTION COSTING		
Revenues: $1,000 × 6,000 units		$6,000,000		Revenues: $1,000 × 6,000 units		$6,000,000
Variable cost of goods sold:				Cost of goods sold:		
Beginning inventory	$ 0			Beginning inventory	$ 0	
Variable manufacturing costs: $200 × 8,000 units	1,600,000			Variable manufacturing costs: $200 × 8,000 unit	1,600,000	
				Allocated fixed manufacturing costs: $135 × 8,000 units	1,080,000	
Cost of goods available for sale	1,600,000			Cost of goods available for sale	2,680,000	
Deduct ending inventory: $200 × 2,000 units	(400,000)			Deduct ending inventory: $335 × 2,000 units	(670,000)	
Variable cost of goods sold		1,200,000		Cost of goods sold		2,010,000
Variable marketing costs: $185 × 6,000 units sold		1,110,000				
Contribution margin		3,690,000		Gross Margin		3,990,000
Fixed manufacturing costs		1,080,000		Variable marketing costs: $185 × 6,000 units sold		1,110,000
Fixed marketing cost		1,380,000		Fixed marketing costs		1,380,000
Operating income		$1,230,000		Operating Income		$1,500,000
Manufacturing costs expensed in Panel A:				Manufacturing costs expensed in Panel B:		
Variable cost of goods sold		$1,200,000				
Fixed manufacturing costs		1,080,000				
Total		$2,280,000		Cost of goods sold		$2,010,000

Example 2: Stassen sales of telescope was 6,000; 7,000; and 8,000 units, when 8,000 units were produced during 2012, 2013 and 2014 with the following inputs.

	2012	2013	2014
Budgeted production	8,000	8,000	8,000
Beginning inventory	0	2,000	500
Actual production	8,000	5,000	10,000
Sales	6,000	6,500	7,500
Ending inventory	2,000	500	3,000

All other information is similar with the 2012. The income statement under each of these scenarios would be as follows:

Panel A: VARIABLE COSTING						
	2012		2013		2014	
Revenues: $1,000 × 6,000; 6,500; 7,500 units		$6,000,000		$6,500,000		$7,500,000
Variable cost of goods sold:						
Beginning inventory: $200 × 0; 2,000; 500 units	$ 0		$ 400,000		$ 100,000	
Variable manufacturing costs: $200 × 8,000; 5,000; 10,000 units	1,600,000		1,000,000		2,000,000	
Cost of goods available for sale	1,600,000		1,400,000		2,100,000	
Deduct ending inventory: $200 × 2,000; 500; 3,000 units	(400,000)		(100,000)		(600,000)	
Variable cost of goods sold		1,200,000		1,300,000		1,500,000
Variable marketing costs: $185 × 6,000; 6,500; 7,500 units		1,110,000		1,202,500		1,387,500
Contribution margin		3,690,000		3,997,500		4,612,500
Fixed manufacturing costs		1,080,000		1,080,000		1,080,000
Fixed marketing costs		1,380,000		1,380,000		1,380,000
Operating income		$1,230,000		$1,537,500		$2,152,500

Panel B: ABSORPTION COSTING						
	2012		2013		2014	
Revenues: $1,000 × 6,000; 6,500; 7,500 units		$6,000,000		$6,500,000		$7,500,000
Cost of goods sold:						
Beginning inventory: $335 × 0; 2,000; 500 units	$ 0		$ 670,000		$ 167,500	
Variable manufacturing costs: $200 × 8,000; 5,000; 10,000 units	1,600,000		1,000,000		2,000,000	
Allocated fixed manufacturing costs: $135 × 8,000; 5,000; 10,000 units	1,080,000		675,000		1,350,000	
Cost of goods available for sale	2,680,000		2,345,000		3,517,500	
Deduct ending inventory: $335 × 2,000; 500; 3,000 units	(670,000)		(167,500)		(1,005,000)	
Adjustment for production-volume variance[a]	0		405,000	U	(270,000)	F
Cost of goods sold		2,010,000		2,582,500		2,242,500
Gross Margin		3,990,000		3,917,500		5,257,500
Variable marketing costs: $185 × 6,000; 6,500; 7,500 units		1,110,000		1,202,500		1,387,500
Fixed marketing costs		1,380,000		1,380,000		1,380,000
Operating Income		$1,500,000		$1,335,000		$2,490,000

*Production-volume variance = Budgeted fixed manufacturing costs – Fixed manufacturing overhead allocated using budgeted cost per output unit allowed for actual output produced (Panel B, line 22)
2012: $1,080,000 – ($135 × 8,000) = $1,080,000 – $1,080,000 = $0
2013: $1,080,000 – ($135 × 5,000) = $1,080,000 – $675,000 = $405,000 U
2014: $1,080,000 – ($135 × 10,000) = $1,080,000 – $1,350,000 = ($270,000) F
Production volume variance can also be calculated as follows:
Fixed manufacturing cost per unit × (Denominator level – Actual output units produced)
2012: $135 × (8,000 – 8,000) units = $135 × 0 = $0
2013: $135 × (8,000 – 5,000) units = $135 × 3,000 = $405,000 U
2014: $135 × (8,000 – 10,000) units = $135 × (2,000) = ($270,000) F

2014: $135 × (8,000 – 10,000) units = $135 × (2,000) = ($270,000) F

Note; U-unfavorable F-favorable

In 2013, production was 5,000 units, 3,000 lower than the denominator level of 8,000 units. The result is an unfavorable production-volume variance of $405,000 ($135 per unit 3,000 units). The year 2014 has a favorable production-volume variance of $270,000 ($135 per unit 2,000 units), due to production of 10,000 units, which exceeds the denominator level of 8,000 units.

The production-volume variance, which relates only to fixed manufacturing overhead, exists under absorption costing but not under variable costing. Under variable costing, fixed manufacturing costs of $1,080,000 are always treated as an expense of the period, regardless of the level of production (and sales).

Here's a summary (using information from above)

	2012	2013	2014
1. Absorption-costing operating income	$1,500,000	$1,335,000	$2,490,000
2. Variable-costing operating income	$1,230,000	$1,537,500	$2,152,500
3. Difference: (1) – (2)	$ 270,000	$ (202,500)	$ 337,500

Fixed manufacturing costs in ending inventory are deferred to a future period under absorption costing. For example, $270,000 of fixed manufacturing overhead is deferred to 2013 at December 31, 2012. Under variable costing, all $1,080,000 of fixed manufacturing costs are treated as an expense of 2012.

Role of various denominator levels in absorption costing

Absorption Costing and Alternative Denominator-Level

There are four different capacity levels used as the denominator to compute the budgeted fixed manufacturing cost rate. Those are theoretical capacity, practical capacity, normal capacity utilization, and master-budget capacity utilization.

Theoretical Capacity and Practical Capacity

In business and accounting, capacity ordinarily means a "constraint," an "upper limit. **Theoretical capacity:** is the level of capacity based on producing at full efficiency all the time. Stassen can produce 25 units per shift when the production lines are operating at maximum speed. If we assume 360 days per year, the theoretical annual capacity for 2 shifts per day is as follows:

25 units per shift x 2 shifts per day x 360 days = 18,000 units

Theoretical capacity is theoretical in the sense that it does not allow for any plant maintenance, shutdown periods, interruptions because of downtime on the assembly lines, or any other factors. Theoretical capacity represents an ideal goal of capacity utilization.

Theoretical capacity levels are unattainable in the real world but they provide a target to which a company can aspire.

Practical capacity: is the level of capacity that reduces theoretical capacity by considering unavoidable operating interruptions, such as scheduled maintenance time, shut-downs for holidays, and so on. Assume that practical capacity is the practical production rate of 20 units per shift (as opposed to 25 units per shift under theoretical capacity) for 2 shifts per day for 300 days a year (as distinguished from 360 days a year under theoretical capacity). The practical annual capacity is as follows:

20 units per shift * 2 shifts per day * 300 days = 12,000 units

Engineering and human resource factors are both important when estimating theoretical or practical capacity. Engineers at the Stassen facility can provide input on the technical

capabilities of machines for cutting and polishing lenses. Human-safety factors, such as increased injury risk when the line operates at faster speeds, are also necessary considerations in estimating practical capacity. With difficulty, practical capacity is attainable.

Normal Capacity Utilization and Master-Budget Capacity Utilization

Both theoretical capacity and practical capacity measure capacity levels in terms of what a plant can **supply available capacity**. In contrast, normal capacity utilization and master budget capacity utilization measure capacity levels in terms of **demand for the output of the plant,** that is, the amount of available capacity the plant expects to use based on the demand for its products.

In many cases, budgeted demand is well below production capacity available.

Normal capacity utilization is the level of capacity utilization that satisfies average customer demand over a period (say, two to three years) that includes seasonal, cyclical, and trend factors.

Master-budget capacity utilization is the level of capacity utilization that managers expect for the current budget period, which is typically one year. These two capacity utilization levels can differ for example, when an industry, such as automobiles or semiconductors, has cyclical periods of high and low demand or when management believes that budgeted production for the coming period is not representative of long-run demand.

Denominator-Level Capacity Concept	Budgeted Fixed Manufacturing Costs per Year	Budget Capacity Level (in units)	Budgeted Fixed Manufacturing Cost per Unit
(1)	(2)	(3)	(4) = (2) / (3)
Theoretical capacity	$1,080,000	18,000	$ 60
Practical capacity	$1,080,000	12,000	$ 90
Normal capacity utilization	$1,080,000	10,000	$108
Master-budget capacity utilization	$1,080,000	8,000	$135

Choosing a Capacity Level

Managers determine different denominator levels for the different capacity concepts and calculate different budgeted fixed manufacturing costs per unit. The problems with and effects of different denominator-level choices for different purposes, including

(a) Product costing and capacity management,

(b) Pricing,

(c) Performance evaluation,

(d) External reporting, and

(e) Tax requirements.

Adjusting inventories for external reporting

The magnitude of the favorable/unfavorable production-volume variance under absorption costing is affected by the choice of the denominator level used to calculate the budgeted fixed manufacturing cost per unit. Assume the following actual operating information for Stassen in 2012:

Beginning inventory	0	
Production	8,000	units
Sales	6,000	units
Ending inventory	2,000	units
Selling price	$ 1,000	per unit
Variable manufacturing cost	$ 200	per unit
Fixed manufacturing costs	$ 1,080,000	
Variable marketing cost	$ 185	per unit sold
Fixed marketing costs	$ 1,380,000	

$$\text{Production-volume variance} = \left(\begin{array}{c}\text{Budgeted fixed}\\ \text{manufacturing overhead}\end{array}\right) - \left(\begin{array}{c}\text{Fixed manufacturing overhead allocated using}\\ \text{budgeted cost per output unit}\\ \text{allowed for actual output produced}\end{array}\right)$$

Production-volume variance (theoretical capacity)	= $1,080,000 − (8,000 units × $60 per unit)
	= $1,080,000 − 480,000
	= 600,000 U
Production-volume variance (practical capacity)	= $1,080,000 − (8,000 units × $90 per unit)
	= $1,080,000 − 720,000
	= 360,000 U
Production-volume variance (normal capacity utilization)	= $1,080,000 − (8,000 units × $108 per unit)
	= $1,080,000 − 864,000
	= 216,000 U
Production-volume variance (master-budget capacity utilization)	= $1,080,000 − (8,000 units × $135 per unit)
	= $1,080,000 − 1,080,000
	= 0

Stassen disposes of its production-volume variance at the end of the fiscal year will determine the effect this variance has on the company's operating income. The three alternative approaches Stassen can use to dispose of the production-volume variance.

1**. Adjusted allocation-rate approach.** This approach restates all amounts in the general and subsidiary ledgers by using actual rather than budgeted cost rates. Given that actual fixed manufacturing costs are $1,080,000 and actual production is 8,000 units, the recalculated fixed manufacturing cost is $135 per unit ($1,080,000 ÷ 8,000 actual units). Under the adjusted allocation-rate approach, the choice of the capacity level used to calculate the budgeted fixed manufacturing cost per unit has no effect on year- end financial statements. In effect, actual costing is adopted at the end of the fiscal year.

2. Proration approach. The under allocated or over allocated overhead is spread among ending balances in Work-in-Process Control, Finished Goods Control, and Cost of Goods Sold. The proration restates the ending balances in these accounts to what they would have been if actual cost rates had been used rather than budgeted cost rates. The proration approach also results in the choice of the capacity level used to calculate the budgeted fixed manufacturing cost per unit having no effect on year-end financial statements.

3. Write-off variances to cost of goods sold approach: The common reason and explanation for the increasing operating-income is the amount of fixed manufacturing costs incurred that is included in ending inventory at the end of the year. As this amount increases, so does operating income. The amount of fixed manufacturing costs inventoried depends on two factors: the number of units in ending inventory and the rate at which fixed manufacturing costs are allocated to each unit.

The under allocated or over allocated overhead is simply write off to cost of goods sold. The objective is to write off the portion of the production-volume variance that represents the cost of capacity not used to support the production of out-put during the period.

Exercise: Nascar Motors assembles and sells motor vehicles and uses standard costing. Actual data relating to April and May 2013 are as follows

	April		May
Unit data			
Beginning inventory	0		150
Production	500		400
Sales	350		520
Variable costs			
Manufacturing cost per unit produced	$ 10,000		$ 10,000
Operating (marketing) cost per unit sold	3,000		3,000
Fixed costs			
Manufacturing costs	$2,000,000		$2,000,000
Operating (marketing) costs	600,000		600,000

The selling price per vehicle is $24,000. The budgeted level of production used to calculate the budgeted fixed manufacturing cost per unit is 500 units. There are no prices, efficiency, or spending variances. Any production-volume variance is written off to cost of goods sold in the month in which it occurs.

Required

- Prepare April and May 2013 income statements for Nascar Motors under (a) variable costing and (b) absorption costing.
- Prepare a numerical reconciliation and explanation of the difference between operating income for each month under variable costing and absorption costing.

CHAPTER SIX

Cost Allocation

Chapter learning objectives

After you have read and studied this chapter, you should be able to:

- Discuss the various purposes of cost allocations.
- Describe how the single- rate cost allocation method differs from the dual-rate method
- Explain how the choice of budgeted versus actual allocation rates changes the risks that managers face.
- Distinguish among direct, step down and reciprocal methods of allocating support department costs.
- Distinguish between the incremental and stand-alone cost allocation methods.
- Out line the consequences of the inappropriate use of an allocation base.

6.1 Introduction

Cost allocation is an inescapable problem in nearly every organization and in nearly every facet of accounting. It is an important topic because many of the costs associated with designing, producing, and distributing products and services are not easily identified with the products and services that are created. Although an introduction to overhead cost allocation is provided in chapter 3, the overall topic is much broader than using a predetermined overhead rate. The purpose of this chapter is to extend the chapter 3 discussion to include the concepts underlying costs to the various products and services produced.

More specifically, the chapter includes three main sections. The first section provides a discussion of the conceptual foundation for cost allocations including the purposes and underlying logic associated with the various allocation methods. Section two provides a brief discussion of two (single rate versus dual rates) approaches for assigning costs to cost objects. Finally, the third section extends the discussion of departmental overhead rates to include the

allocation from support (services) departments to producing departments. This part includes three methods for accomplishing the allocation process. Allocation of common costs is also part of this section.

6.2 Purpose of cost allocations

The purpose of cost allocations are closely related to the purposes of information systems. Cost allocations are needed to value inventory for external reporting purposes, for planning and monitoring the cost of activates and processes, and for various short-term and long-term strategic decisions. Some examples include decisions to "Make or Buy" sub-components and services, how to price products and services, when to add or discontinue various products and services and when to expand or contract the size of a segment of the company. The accounting treatment for all of these aspects will be discussed in detail in cost and management accounting II.

In addition, cost allocation methods are components of the overall performance evaluation system. Therefore, system designers must also carefully consider the motivational or behavioral aspects of the alternative cost allocation methods.

Exhibit 6.1 summary of purpose of cost allocation

Purpose	Illustrations
1. To provide information for economic decisions	• To decide whether to add a new air line flight • To decide whether to manufacture a component part of a television set or to purchase it from another manufacturer • To decide on the selling price for a customized products or service.
2. To motivate managers and other	• To encourage the design of products that are simpler to

employees	manufacture or less costly to service • To encourage sales representatives to push high-margin products or services
3. To justify costs or compute reimbursements	• To cost products at a " fair price" often done with government defense contracts • To compute reimbursements for a consulting firm that is paid a percentage of the cost savings resulting from the implementation of its recommendations
4. To measure in come and assets for meeting external regulatory and legal reporting obligations	• To cost inventories for financial reporting to stock holders, bond holders, and so on (under generally accepted accounting principles inventoreable costs include manufacturing costs but exclude Research & Development, Marketing, distribution, customer service costs. • To cost inventories for reporting to tax authorities.

6.3 The supporting logic of cost allocation methods.

While allocating cost to different units or products or some other cost objects, there should be some criteria (or supporting logical) to be followed. Accordingly, the following are some of the supporting logic (criterion) used as guidelines while allocating costs to units and /or products and services.

a) **Cause and effect:** From the perspective of the matching concept (i.e. Matching cost and benefits) it is logical to allocate a cost to the cost object (e.g. user, activity, department, product) based on a **"cause and effect"** relationship. The idea is to allocate the cost to whatever causes or drives the cost. Using this logic or criteria, managers identify the variable or variables that cause resources to be consumed. For example, managers may use hours as the variables when allocating the costs of a quality testing area to products.

Cost allocations based on the cause -and-effect criterion are likely to be the most credible to the operating personnel.

b) Fairness or equity: When the driver for a cost can not be identified, or identified easily, and then an allocation scheme perceived to be **"fair and equitable"** might be used. This criterion is often cited in government contracts when cost allocations are the basis for establishing a price satisfactory to the government and its supplier. Cost allocation here is viewed as a **"reasonable"** or "fair" means of establishing a selling price in the minds of the contracting parties.

c) Benefit received: using this criterion mangers, identify the beneficiaries of the outputs of the cost object. The costs of the cost object are allocated among the beneficiaries in proportion to the benefits each receives. For example, consider a corporate wide advertising program that promotes the general image of the corporation rather than any individual product. The cost of this program may be allocated on the basis of division revenues. The higher the revenues, the higher the divisions allocated cost of the advertising program. The rational behind this allocation is the belief that divisions with higher revenues apparently benefit from the advertising more than division with lower revenues and therefore, ought to be allocated more of the advertising costs.

d) Ability to bear: This criterion advocates allocating costs in proportion to the cost object's ability to bear them. An example is the allocation of corporate executive salaries on the basis of divisions operating income. The presumption is that the more profitable a given division is a greater ability it has to absorb corporate head quarter's costs

Activity 6.1

- Discuss how cost allocation is an inescapable task.
- Describe the purposes of cost allocation for different activates.
- Compare and contrast the supporting logic of cost allocation methods.

6.4. Allocating costs from One department to another (interdepartmental cost allocation)

The various functional areas with in a manufacturing facility are usually separated into two types of departments. These include producing (operational) departments and service departments

Producing departments: Include those departments or units where the central purposes of the organization are carried out. These departments involve in converting raw or direct materials into finished products. Examples of such departments or units would include the surgary department in a hospital, the undergraduate and graduate programs in a university, and production departments such as milling, assembly, and painting in a manufacturing company.

Service departments: A services department is a unit in an organization that is not involved directly in producing the organization's goods or services. However, a service department does provide a service that enables the organization's production process to take place. Some examples of service departments include purchasing, receiving and storage, engineering, power maintenance, packing, shipping, inventory control inspection and quality control. For example, the maintenance department in an automobile plant does not make automobiles but if it did not exist, the production process would stop when manufacturing machine broke down.

A service department such as maintenance department must exist in order for an organization to carry out its primary function. Therefore, the cost of running a service department is part of the cost incurred by the organization in producing goods and services. In order to determine the cost of those goods or services, all service department cost must be allocated to the production department in which the goods or services are produced. For this reason, the costs incurred in an automobile plant's maintenance department are allocated to all of the production departments that have machinery. Three key issues that arise when allocating costs from one department to another are:

1. Whether to use a single rate method or dual rate method
2. Whether to use budgeted rate or actual rate
3. Whether to use budgeted quantities or actual quantities

1. Single rate cost allocation versus dual rate cost allocation methods

a) The single rate cost allocation method

This method pools all cost in one cost pool and allocates these costs to cost object using the same rate per unit of the single allocation base. There is no distinction between costs in cost pool in terms of cost behavior (such as fixed costs versus variable costs). Under some circumstances, this simple approach can results in an unfair cost allocation among the using departments and may lead to inappropriate decisions.

b) The dual-rate cost allocation method

The dual rate cost allocation refers to using separate rates or allocations for fixed and variable service costs. This method classifies costs into two sub cost pools (avariable cost sub pool and a fixed costs sub pool). This method by allocating fixed costs and variable costs separately avoid fairness problem that is inherent in the case of single - rate allocation method.

Illustration

Suppose that Morgan industries which has a central computer department. This department has only two users-Micro computer division and peripheral equipment Division. The following data apply to the coming budget year.

→ Fixed costs of operating the computer facility (in the relevant range of 1,000 to 15,000 hours) ……..……$3,000,000

→ Total capacity available ……15,000 hours

→ Budgeted long-run usage (quantity) in hours

Micro computer Division ……..8,000 hours

Peripheral equipment division ……4,000 hours

Total 12,000 hours

→ Budgeted variable costs per hour

In the 1,000-15,000 hours relevant range ……. $200 per hour used

Central compute Department's cost allocation under single rate method

Under single-rate method, the costs of the central computer department (assuming budgeted usage is the allocation base and budgeted rates are used) would be allocated follows:

→ Total cost pool = 3,000,000 + (12,000 budgeted

Hours x $200) $5,400,000

→ Budgeted usage 12,000 hours

→ Budgeted total rate = $\underline{\$\ 5,400,000}$ = $450 per hour used

Per hour used 12,000 hours

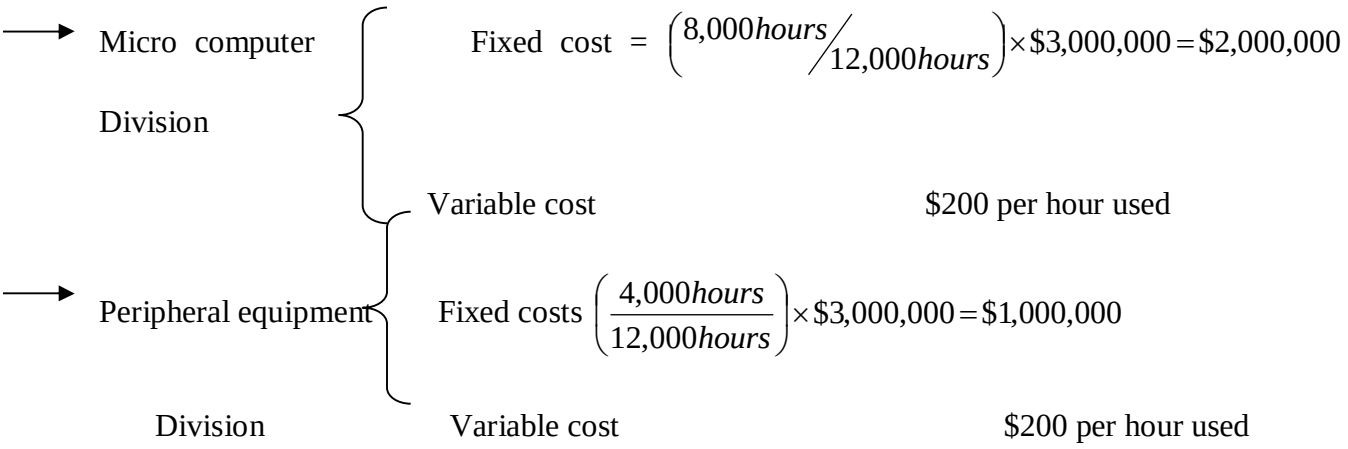
Here in this approach, the allocation rate for each division will be the same i.e. $450 per hour used.

The $450 rate includes an allocated amount of $250 per hour ($3000, 000 ÷ 12,000 hours) for the fixed cost of operating facility. These fixed costs will be incurred whether the computer runs its 15,000 hours capacity, its 12,000 hours budgeted usage, or even, say only 6,000 hours usage.

Central computer Department's cost allocation under dual rate method

When the dual-rate method is used, allocation bases for each different sub-cost pool must be chosen. Assume that the budged rates are used, and the allocation quantities chosen are budgeted usage for fixed costs and actual usage for variable costs. The total budgeted usage of 12,000 hours comprises 8,000 hours for the micro computer Division and 4,000 hours for the peripheral equipment division.

The costs allocated to the divisions would be:



Assumed further that, during the coming year the actual computer hours of 9,000 and 3,000 are used by micro computer division and peripheral equipment division respectively. The costs allocated to these two divisions would be:

Under the single rate method

Micro computer division = 9,000 hours x $450 = $4,050,000

Peripheral equipment division = 3,000 hours X $450=$350,000

Under the dual rate method:

Micro computer division = $2,000,000 + (9,000 hours x $200) = $3,800,000

Peripheral equipment division = $1,000,000 + (3,000 hours x$200) =$1,600,000.

One obvious benefit of using the single rate method is the low cost of implementation. It avoids the often expensive analysis necessary to classify the individual cost items of a department into fixed and variable categories. However, the allocation of these costs on the basis of single rate may lead to a decision that may adversely affect the goal of the organization. For example, the micro computer decision uses on external vendor that charges $360 per hour, when the central computer department has excess capacity. In the short-run, Morgan industries incurs an extra $160 per hour because this external vendor is used ($360. external purchase price per hour minus the $200 internal variable costs per hour) instead of its own central computer Department. The decision made by micro computer division can decrease its own cost but the overall cost to the Morgan industries will increase.

An important benefit of the dual rate method is that it signals to division mangers how variable costs and fixed costs behave differently. This important information could steer division mangers into making decisions that benefit the corporation as well as each division. For example, it would signal that using external vendor who charges more than $200 per hour could result in Morgan industries being worse off than if it had used its own central computer department which has a variable cost of $200 per hour.

2. Budgeted versus Actual rates

The decision whether to use budgeted cost rates or actual cost rates affects the level of uncertainly that user departments face.

a) Budgeted rates :

Let the user departments know the cost rates they will be charged in advance. Users are then better equipped to determine the amount of the service to request and, if the option exists, whether to use the internal department source or an external vendor. Budgeted rates also help to motivate the manager of the support department (for example, the central Department) to improve efficiency, not the user department, bears the risk of any unfavorable cost variances. Because the user department, do not pay for any costs that exceed the budgeted rates.

The managers of support department likely would view the budgeted rates negatively, especially when unfavorable cost variances occur due to price increase of his or her control. Thus, to overcome this problems, some organizations are recognizing that it may not always be best to impose the risk of variance from budgeted amount completely on the support department (as when costs are allocated using budgeted rates) or completely on the user departments (as when costs are allocated using actual rates). For example, the two departments may agree to share the risk (through an explicit formula) of a large, uncontrollable increase in the price of materials used by the support department.

b) Actual rates when actual rates are use the user department will not know the rates charged until the end of the period

3. **Budgeted versus actual usage allocation bases:**

Should a service department allocate its actual costs to operating departments or should it allocate its budgeted costs? The answer is that budgeted costs should be allocated. The problem with allocating actual costs is that it burdens the operating department with the ineficienies of the services departments' managers. If actual costs are, then any lack of cost control on the part of the service departments' manger is simply buried in a routine allocation to other departments.

When actual usage is the allocation base, user division will not know in advance the amount of cost to be allocated to them until the end of the budget period. When budget usage is the allocation base, user divisions will know in advance their allocated costs. This information helps the user divisions with short - run and long - run planning. The main justification given for the use of budgeted usage to allocate fixed costs relates to long-run planning. Organizations commit to infrastructure costs (such as fixed costs of a support department) on the basis of long-run planning horizon; the use of budgeted usage to allocate these fixed costs is consistent with long-run horizon.

If fixed costs are allocated on the basis of budgeted long-run usage, some managers may be tempted to under estimate their planned usage. In this way, they will bear a lower percentage of the total costs (assuming all other mangers do not similarly under estimate their usage). Some organizations offer rewards in the form of salary increase and promotions to managers who make accurate forecasts of long-run usage (this is the carrot approach), and or impose cost penalties for under predicting long-run usage (this is the stick approach).

Activity 6.2

- Distinguish between production departments and service departments.
- Describe the conditions and purposes of using either the single rate or the dual rate cost allocation methods.
- List down the advantages and benefits of using a budgeted rate.
- Service departments should allocate its actual costs. Do you agree or disagree? Discuss.

6.5 Support (service department) cost Allocation

6.5.1 Types of Relationships between Service Departments

First stage allocations may include self services and reciprocal services between departments as well as services to producing departments. Self services refers to situations where service departments use of their own services. For example, the power department uses some power and the maintenance department requires some maintenance. Reciprocal service refers to situations where two or more services departments provide services to each other. For example the power department provides electric power to the maintenance department and the maintenance department provides repair and maintenance to the power department. These relationships affect the choice of allocation methods as well as the accuracy of the first stage cost allocations. The effect of service department costs on products and services is shown in the following exhibit.

Exhibit 6.1. Effect of service department costs on products and services

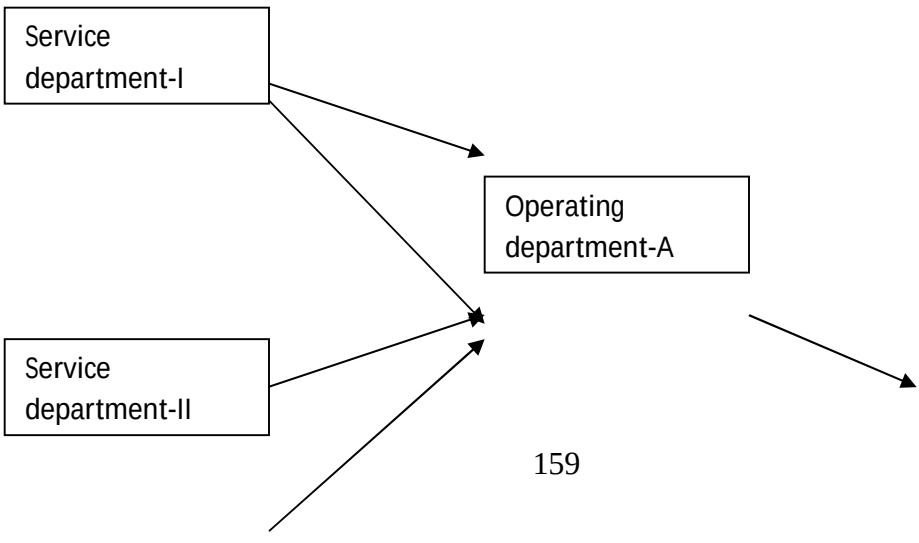
Stage I Stage II

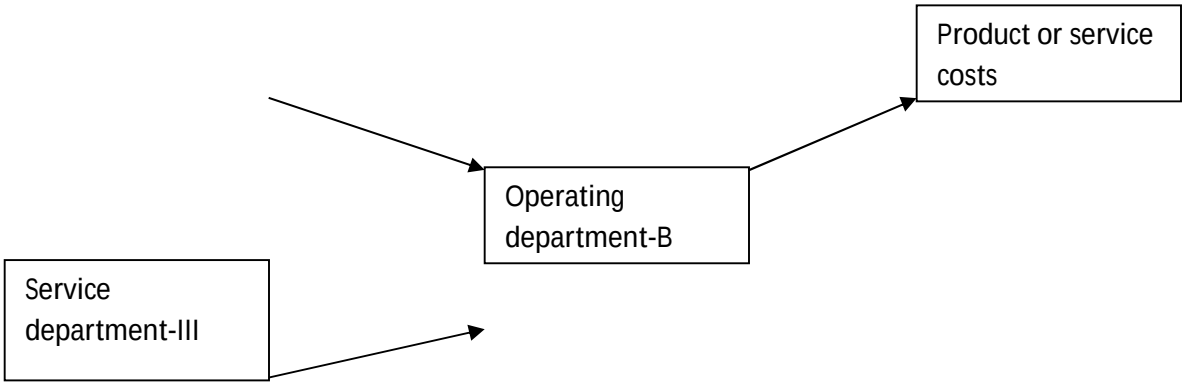
Service department Operating department overhead costs, plus allocated

Cost are allocated service department costs, are applied to products

to operating and services by means of departmental overhead rates

department





6.5.2 Types of support (Service) Department cost allocation

The allocation of services department costs to operating departments is very essential since the amount of costs allocated are presumed to represent each department's "fair share" of the costs of services provided for it and, the allocations are included in the performance evaluations of operating departments and also included in determining their individual profitability. There are three alternative approaches for allocating service department costs. These include :

1. The direct method
2. the step down or sequential method
3. The reciprocal method

1. Direct allocation Method

Under the direct method, each service department's costs are allocated among only operating (production) departments that consume part of the service department's out put. The direct method simplifies the allocation process by ignoring self services and reciprocal services between service departments. The benefit of direct method is its simplicity. Although this is the simplest method, it is also the least actuate method. Its disadvantage is failure to recognize reciprocal services provided among support departments. Notice that the proportion of each service department's costs to be allocated to each operating department is determined by the relative proportion of the service department's output consumed by the operating departments.

To illustrate, consider Melbreg industries which manufactures engines used in electric power generating plants Melbreg has two support departments (plant maintenance and information system) and two operating departments (Machining and Assembly) in manufacturing facility.

The two support departments at Melbreg provide reciprocal support to each other as well as to the two operating departments. The data for our example is listed in exhibit 6.2.

Exhibit 6.2. Data for allocating support department costs at Melbreg for 2001

	Support Department		**Operating Department**		
	Plant Maintenance	Information system	Machining	Assembly	Total
Budgeted factory Over head costs Before any inter Department cost Allocations	$600,000	$116,000	$400,000	$200,000	$1,316,000
Support work furnished:					
By plant maintenance:					
Budgeted labor hours	_	1,600	2400	4000	8,000
Percentage	_	20%	30%	50%	100%
By information system:					
Budgeted computer time	200	-	1,600	200	2000
Percentage	10%	-	80%	10%	100%

As it can be see from the above exhibit, the plant maintenance department provides a total of 8,000 hours of support work: 20% $(1{,}600 \div 800)$ goes to the information systems support department, 30% $(2{,}400 \div 8{,}000)$ to the machining department and 50% $(4{,}000 \div 8{,}000)$ to the assembly department. On the basis of the above, the direct method of allocating support department costs for year 2001 at Melbreg industries is given as follows in exhibit 6.3.

Exhibit 6.3 direct method of allocating support department costs for 2001 at Melbreg.

	Support Department		Operating Department		
	Plant Maintenance	Information systems	Machining	Assembly	Total
Budgeted factory Over head costs Before any inter Departmental Cost allocation	$600,000	$116,000	$400,000	$200,000	$1,316,000
Allocation of plant Maintenance (3/**8, 5/8**) [1]	(600,000)		225,000	375,000	
	$0				
Allocation of information Systems **(8/9, 1/9)** [2]		(116,000)	103,111	12,889	
Total budgeted factory Over head of operating Departments		$0	$ 728,111	$587,889	$1,316,000

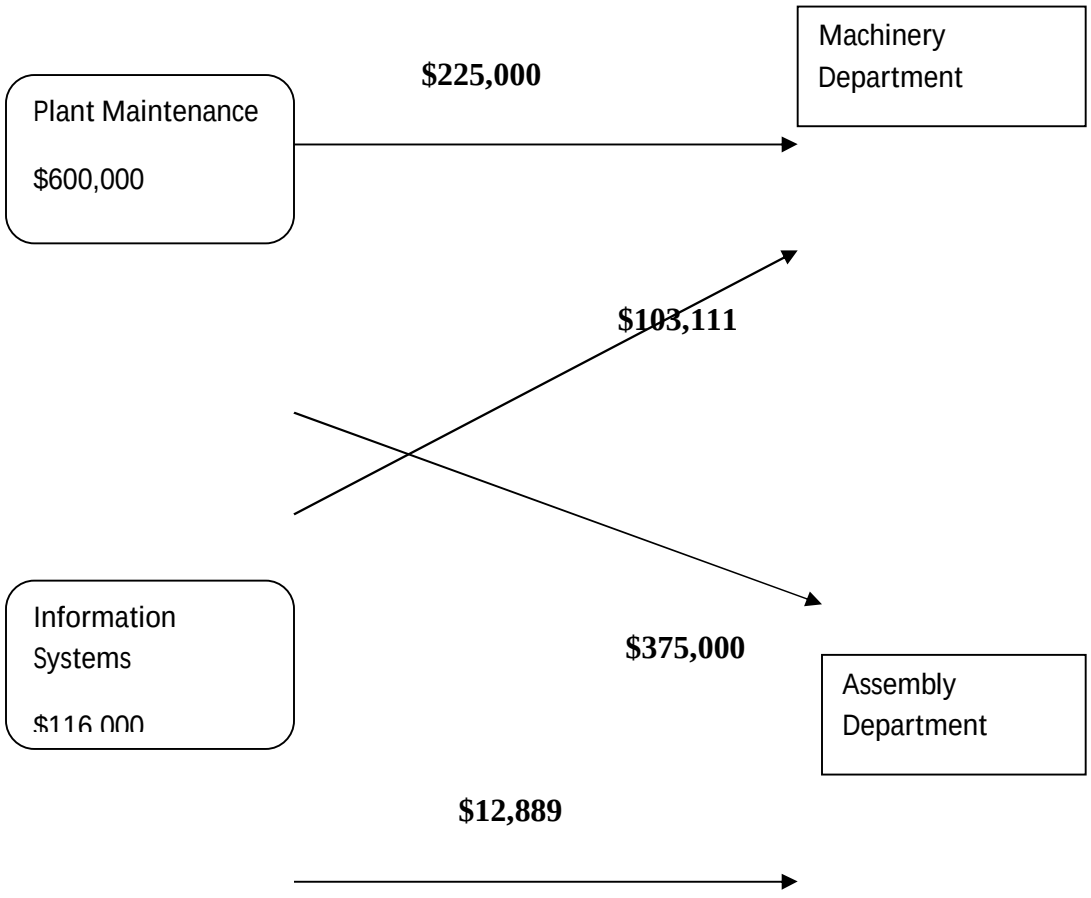
1. Base is (2,400 +4000), or 6,400 hours; 2400 ÷ 6,400 = 3/8 ; 4000 ÷ 6,400= 5/8
2. Base is (1,600 +200), or 1,800 hours; 1,600 ÷ 1,800 = 8/9; 200 ÷ 1,800 = 1/9

NB → the base used to allocate plant maintenance is the budgeted total maintenance labor hours worked in operating departments.

2,400 + 4,000 = 6,400 hours. This excludes the 1,600 hours of support time provided by plant maintenance to information systems.

→ The based used for allocation of information systems costs is 1,600 +200 = 1,800 hours of computer time which excludes the 200 hours of support time provided by information systems to plant maintenance.

Summary of direct method of allocating support department costs



2. Step- down allocation method

As Stated above, the direct method ignores the provision of services by one service department to another services department. This short coming is overcome partially by the step-dawn method of service department cost allocation. This method partially reorganizes the service rendered by service department to other services department. Under this method the managerial accountant first chooses a sequence in which to allocate the service departments costs. A common way to select the first service department in the sequence is to choose the one that serves the largest number of other service departments. The service departments are ordered in

this manner, with the last service department being the one that serves the smallest number of other service departments.

Alternatively, there are two approaches for ranking service departments.

Approach 1: Rank support departments on the percentage of the support departments' total support provided to other support departments. The support department with the highest percentage is allocated first. The support department with the lowest percentage is allocated last. In our Melberg example, the chosen order would be;

Percentage of total support

Service provided to other support department

1. Plant maintenance 20%
2. information systems 10%

Approach 2: Rank support departments on the total dollar of service provided to other support departments. I n our Melberg industries example, the chosen order would be:

Dollar amount of total service provided

to other support departments

1. Plant Maintenance $120,000

2. Information systems $116,000

Under the step down method, once a support department's costs have been allocated no subsequent support department costs are allocated or circulated back to it. Thus, once the plant maintenance department costs are allocated they receive no further allocations from other (lower-ranked) support departments. The result is that the step down method does not recognize the total services that support departments provide to each other exhibit 6.4 reflects this fact.

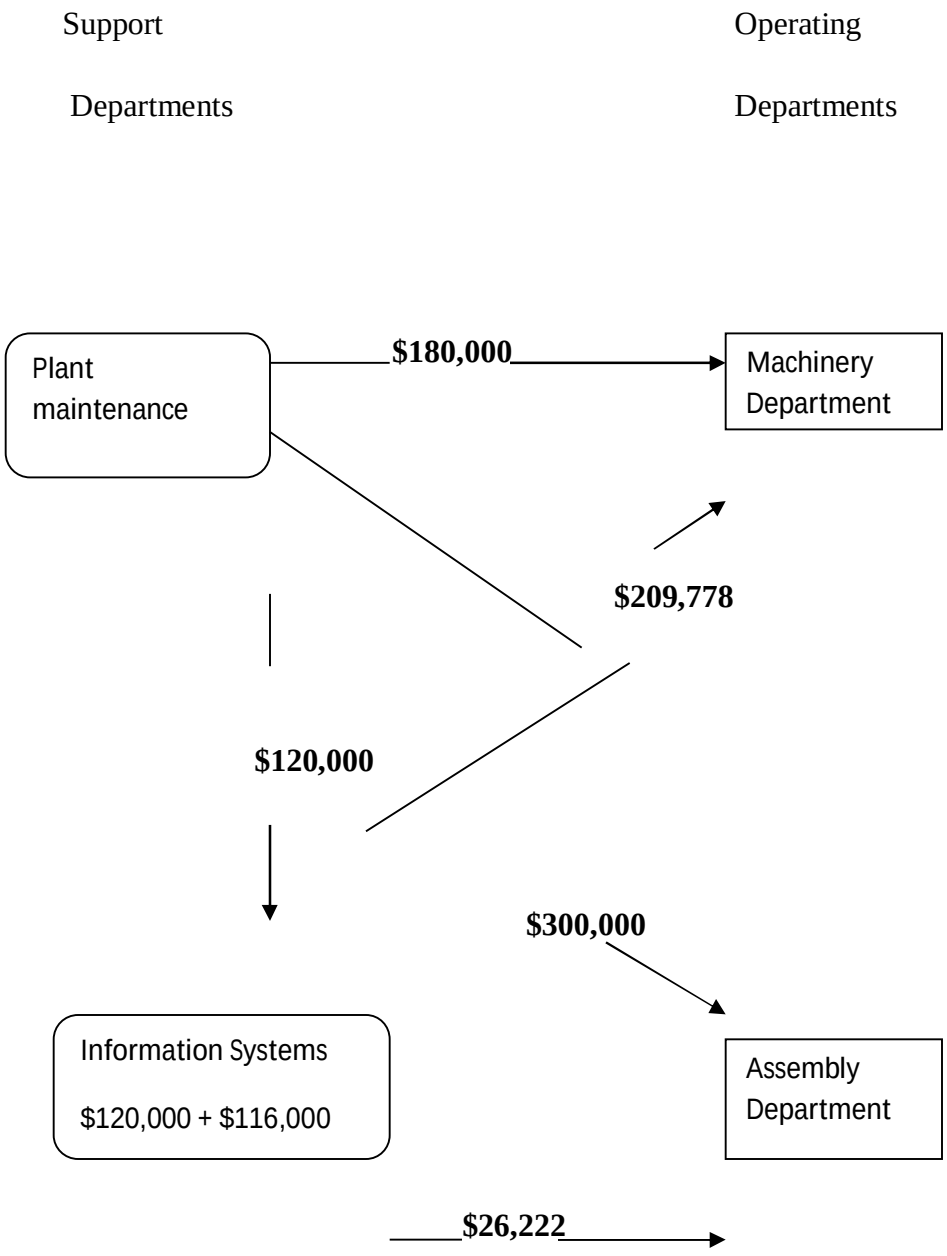
Exhibit 6.4. Step down method of allocating support department costs for 2001 at Melberg industries

	Support Departments		Operating Departments		
	Plant Maintenance	Information Systems	Machining	Assembly	Total
Budgeted Factory overhead costs before any interdepartmental cost allocations	$600,000	$ 116,000	$400,000	$200,000	$1,316,000
Allocation of plant Maintenance:					
(2/10, 3/10, 5/10) [1]	(600,000)	120,000	180,000	300,000	
	$0				
Allocation of Information Systems:					
(8/9, 1/9) [2]		(236,000)	209,778	26,222	
		$0			
Total budgeted Factory Overhead of operating Departments			$789,778	$526,222	$1,316,000

1. Base is (1,600+2,400+4000) or 8,000 hours; 1,600 ÷ 8000 = 2/10; 2,400 ÷ 8000 = 3/10; 4,000 ÷ 8,000 =5/10
2. Base is (1,600+200) or 1,800 hours; 1,600 ÷ 1,800 = 8/9; 200 ÷ 1,800 = 1/9

The above exhibit (exhibit 6.4) shows the step down method were the plant maintenance cost of $600,000 is allocated first; $120,000 allocated to information systems (20% of $600,000); $

180,000 to Machining (30%of $600,000); and $300,000 to assembly (50% of $600,000). The cost of Information systems after allocation total $236,000 ($116,000 +$120,000 from the first round allocation). This $236,000 amount is then allocated among the two operating departments $209,778 (8/9 x$236,000) to machining and $26,222 (1/9 x$236,000) to assembly. Summary of step-down method of allocating support department costs.



3. Reciprocal allocation method

The reciprocal allocation method allocates costs by explicitly including the mutual services provided among all support departments. This method is more accurate than the other two methods because it fully recognizes self-services and reciprocal services between service departments. For example, the plant maintenance department maintains all the computer equipment in the Information systems department. Similarly, Information system provides data base support for plant maintenance. The reciprocal allocation method enables us to incorporate interdepartmental relationships fully into support department cost allocation by fully accounting for the mutual provision of services. However, this method is more involved because it requires the solution to simultaneous equations. The reciprocal method requires three steps:

Step 1: Express support department costs and support department reciprocal relationships in the form of linear equations as shown below.

Let: **PM,** be the complete reciprocated costs of plant maintenance.

IS, be the complete reciprocated costs of information systems. We then express the data in Exhibit 6.2 as follows:

PM= $600,000 +0.1 IS…….1

IS = $116,000 + 0.2 PM ……..2

0.1 IS: the percentage of the information systems work used by plant maintenance.

0.2 PM: is the percentage of the plant maintenance work used by information systems.

The complete reciprocated costs in equations (1) and (2), means the support department's own costs plus any interdepartmental cost allocation

Step 2: Solve the system of simultaneous equations to obtain the complete reciprocated costs of each support department. Where there are two support departments the following substitution approach can be used. Thus by substituting equation (2) into equation (1) we have the following results:

PM = $600,000 + [0.1 ($116,000 +0.2 PM)]

= $600,000 +$11,600+0.02PM

0.98PM = $611,600

$\therefore$ PM= $624,082

By substituting the above result in to equation (2):

IS = $116,000 +0.2 ($624,082)

= $116,000 + $124,816

∴ Is = $240,816

Step 3: Allocate the complete reciprocated costs of each support department to all other departments (both support and operating departments). On the basis of the usage proportions (based on total units of services provided to all departments). For example, consider the Information systems department with a complete reciprocated cost of $240,816. This amount would be allocated as follows.

To plant maintenance (1/10 x 240, 816) =	$24,082
To Machining (8/10 x $240,816) =	192,653
To Assembly (1/10 x$240,819) =	24,082
Total	$240,817

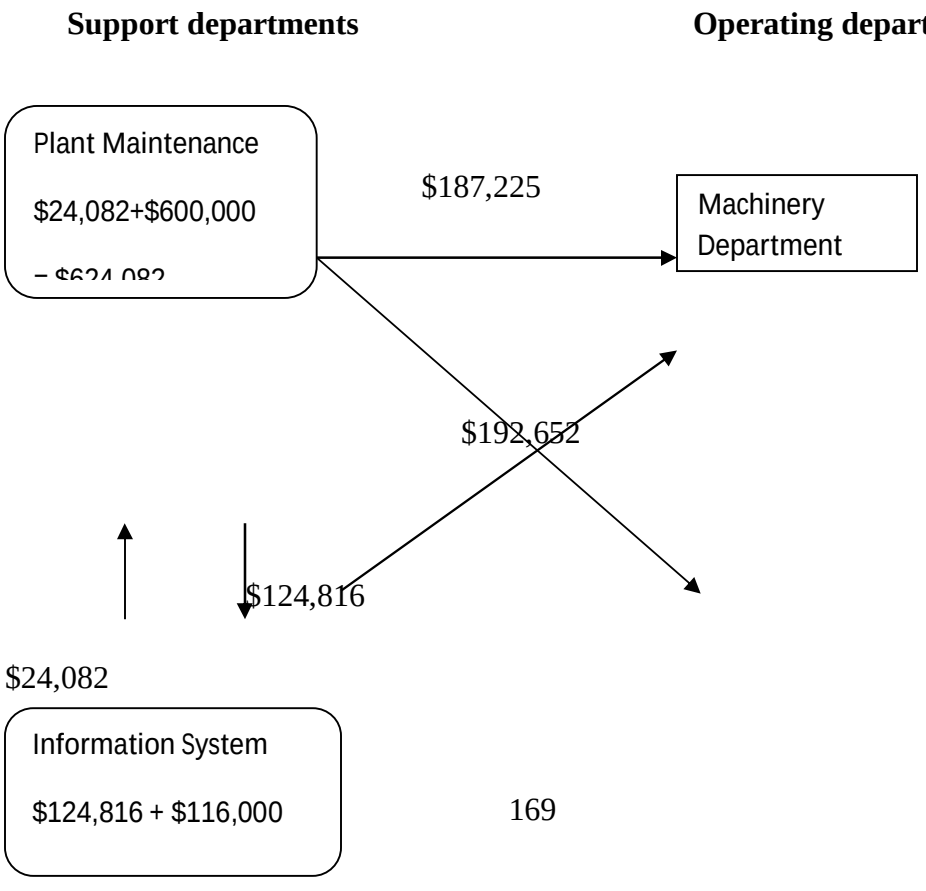
Exhibit 6.5 Reciprocal method of allocating support Department costs for 2001 at Melberg industries:

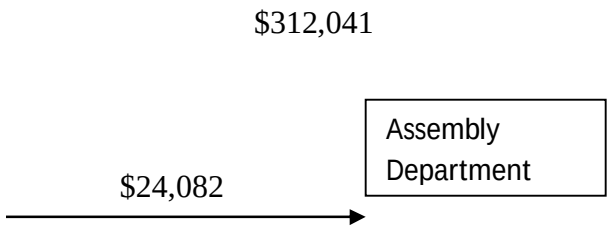
	Support Departments		Operating Departments		
	Plant Maintenance	Information System	Machining	Assembly	Total
Budgeted Factory overhead costs before any interdepartmental cost allocations	$600,000	$116,000	$400,000	$200,000	$1,316,000
Allocation of plant Maintenance:					

(2/10, 3/10, 5/10) [a]	(624,082)	124,816	187,225	312,041
Allocation of Information Systems:				
(1/10, 8/10, 1/10) [b]	24,082	(240,816)	192,652	24,082
	$0	$ 0		
Total budgeted Factory Overhead of operating Departments			$779,877	$536,123 $1,316,000

1. Base is (1600 + 2400+4,001) or 8000 hours; 1,600 ÷ 8,000 = 2/10; 2,400 ÷ 8000 =3/10; 4,000 ÷ 8000=5/10
2. Base is (200+1600+200), or 2,000 hours; 200 ÷ 2,000=1/10; 1,600 ÷ 2000= 1/10; 200 ÷ 2000=1/10

Summary of reciprocal cost allocation method:





One source confusion to some managers using the reciprocal cost allocation method is, why the reciprocated cost of support departments, $864, 898 ($624,082 +240,816) exceeds the amount of $ 716,000 (600,000+&116,000). This is because, the method take into account that the allocation of support costs will be to all departments using its services and not just to the operating departments. The excess of $148,898 ($24,082 for plant maintenance and $124,816 for information systems) is the total costs that are allocated among support departments. The total costs allocated to the operating departments under this method are still $716,000.

Activity 6.3

- Describe the type of relationship between the departments with in an organization.
- Distinguish the three methods of allocating service department cost to users?
- How is the sequence of the service departmental cost allocation is determined in the step-down method?
- How is the service (Support) department cost allocation methods ranked in terms of product cost accuracy?

6.5.3 Allocation of common costs

A common cost is a cost of operating a facility, activities, or like cost objects that is shared by two or more users. Consider Alemu Alaka a senior student in Arba Minch University who has been invited to a job interview with an employer in Addis. After considering the costs and benefits Alemu decided to use the Ethiopian Air way. The round trip Arba Minch -Addis air fare cost is birr 1,200. A week prior to leaving, Alemu is also invited to an interview with an employer in Dire Dawa. The Arba Minch - Dire Dawa round - trip air fare costs is birr 800. Alemu Decided to combine the two recruiting steps into a Arba Minch- Addis - Dire Dawa trip that will costs birr 1,500 in air fare. The birr 1,500 is a common cost that benefits both

prospective employers. Two methods for allocating this common costs between the two prospective employers are now discussed; the stand alone method and the incremental method

a Stand-alone cost allocation method

The stand alone cost-allocation method uses information pertaining to each user of a cost object as a separate operating entity to determine the costs allocation weights. For the airfare common cost of $1,500, information about the separate (stand-alone) round - trip air fares (birr 1,200 and birr 800) is used to determine the allocation weights. The common cost allocation under stand alone method would be:

$$\text{Addis employer} = \frac{\text{Birr 1,200}}{\text{Birr 1,200+ birr 800}} \times \text{Birr 1,500} = 0.60 \times \text{birr 1,500} = \underline{\text{Birr 900}}$$

$$\text{Dire Dawa employer} = \frac{\text{Birr 800}}{\text{Birr 800 + birr1, 200}} \times \text{birr 1,500} = 0.40 \times \text{Birr 1,500} = \underline{\text{Birr 600}}$$

b Incremental cost Allocation method

The incremental cost - allocation method ranks the individual cost objects and then uses this ranking to allocate costs among those cost objects. The first ranked cost object is termed the primary party and is allowed costs up to its costs as a stand alone entity (user). The second ranked costs object is termed the incremental party and is allowed the additional cost that arise from there being two users instead of only the primary user.

Consider again Alemu and his birr 1,500 air fare cost. Assume the Addis employer is viewed as the primary party Alemu's rationale was that he had already committed to go to Addis before accepting the invitation to interview in Dire Dawa. The Addis employer is allocated the full Arba Minch – Addis air fare. The non allocated part is then allocated to the dire Dawa employer as follows:

Party	Cost allocated	Cost remaining to be allocated to other parties

Addis (primary)	Birr 1,200	Birr 300 (birr 1,500 –birr 1,200)
Dire Dawa (incremental)	300	0

Had the Dire Dawa employer been chosen as the primary party, the cost allocations would have been Dire Dawa birr 800 (the stand - alone Arba Minch –Dire Dawa round trip air fare) and Addis Birr 700 (Birr 1,500-birr 800).

Under the incremental method, the primary party typically receives the highest allocation of the common costs. Not surprisingly, most users in common costs situations purpose them selves as the incremental party. In some cases, the incremental party is a newly formed "organization" such as a new product line or a new sales territory.

Activity 6.4

- Distinguish between Stand-alone and Incremental cost Allocation

Summary

In manufacturing industries, departments are classified in to production and service department. A production department is one that is engaged in the actual manufacture of the product by changing the shape, form or nature of material worked upon or by assembling the parts into finished product. A service department on the other hand, is one which is rendering a service to production departments. Services departments are not involved directly in producing an organization's final output of goods or services, but they do provide essential services in an organization. Thus in order to determine the full cot of the organization's final services or goods, service department costs are allocated to the departments directly involved in producing the organization's final output. The supporting logic or criterion that guide cost allocation are "cause and effect" relationship between the cost and cost driver, Fairness or equity, Benefits received and Ability to bear. Three methods are used commonly in practice, the direct method, step - down method and the reciprocal method. These methods may be combined with either the single or the dual allocation approach in which variable and fixed costs are allocated separately.

Self test Exercises:

Part I: Multiple Choices:

Based on the following data answer question 1-5

The Solomon Company has two service departments S1 and S2, and two producing departments P1 and P2. S1 allocates cost based on the number of employees in each department and S2 allocates costs based on the cubic feet of water used in each department. Departmental data for the month are as follows:

	Support Department		**Operating Department**		
	S1	S2	P1	P2	Total
Budgeted factory Over head costs Before any inter Department cost Allocations	$100,000	$200,000	$400,000	$600,000	$1,300,000
Support work furnished:					
By S1:					
Budgeted no. of employees hours	_	20	40	20	80
Percentage	_	25%	50%	25%	100%
By S2:					
Budgeted Cubic					

feet of water	10	-	40	60	110
Percentage	9.09%	-	36.36%	54.55%	100%

1. Using the direct method of allocating service department costs, the service department cost allocated S1 would be;
   a. Zero
   b. (20/80) ($100,000)
   c. (10/110) ($200,000)
   d. None of these
2. Using the direct method, the service department costs allocated to department P1 would be:
   a. (40/100) ($100,000) + (40/110) ($200,000)
   b. (40/80) ($100,000) + (40/110) ($200,000)
   c. (40/60) ($100,000) +(40/100) ($200,000)
   d. (40/110) (100,000) + (40/800 ($200,000)
3. Using the step –down method, the costs of
   a. Department S1 should be allocated first
   b. Department S2 should be allocated first
   c. Both departments should be allocated ignoring the reciprocal services
   d. a and b
   e. b and c
4. Now, ignore your answer to the previous questions and assume that you are asked to allocate department S2's cost first using the step- down method. The cost allocated to S1 would be:
   a. (10/120) ($200,000)
   b. (10/110) ($200,000)
   c. (10/1000 ($200,000)
   d. (20/80) ($200,000)
5. Now, ignore your answer to the previous questions and assume that you are asked to allocate department S1's cost first using the step- down method. The cost allocated to S2 would be:
   a. Zero
   b. (20/100) ($100,000)
   c. (10/120) ($100,000)
   d. (20/80) ($100,000)
   e. (10/110) ($100,000)
6. One of the following is the correct order to put the different cost allocation methods based on their efficiency:; from least to best:
   a. Step- down; Direct; Reciprocal
   b. Reciprocal; Direct; Step- down
   c. Direct; Step- down; Reciprocal
   d. Reciprocal; Step-down; Direct
   e. None of the above
7. One of the following is not among the purposes of cost allocation;
   a. Provide information for decision making
   b. Motivate workers for better production

c. Provide information for proper income measurement
d. Provide information for setting selling price
e. All of the above
f. None of the above

Based on the following information answer question 8-10

Aroon Heather, a graduating senior at a university near San Francisco, received an invitation to visit a prospective employer in New York. A few day later, she received an invitation from a prospective employer in Chicago. She decided to combine her visits, traveling from San Francisco to New York, New York to Chicago, and Chicago to San Francisco. Heather received job offers from both companies. She was puzzled about how to allocate her travel costs between the two employers.

She gathered the following data:

	Regular round – trip fares with no stopovers
San Francisco to New York	$1,400
San Francisco to Chicago	$1,100

Heather paid $1,800 for her three- leg flight (San Francisco to Mew York, New York to Chicago, Chicago to San Francisco)

8. The cost allocated between New York and Chicago employer using the stand alone allocation method should be
   a. $1,400 and $ 1,100 respectively
   b. $1,008 and $792 respectively
   c. $1,100 and $ 1,400 respectively
   d. Some other amount
9. Assume the New York employer is the primary party, the cost allocated should be
   a. New York employer $ 1,008 and Chicago employer $792
   b. New York employer $1,400 and Chicago employer $400
   c. New York employer $400 and Chicago employer $ 1,400
   d. Some other amount
10. Assume the Chicago employer is the primary party, the cost allocated should be

a. Chicago employer $1,100 and New York employer $700
b. Chicago employer $700 and New York employer $1,100
c. Chicago employer $1,008 and New York employer $792
d. Some other amount

Part II: Exercises

1. Midroc business group has a power plant designed and built to serve its three factories. Data for 2008 are as follows:

Usage in kilowatt-hours

Factory	Budget	Actual
Wanza	100,000	80,000
Midroc Gold	60,000	120,000
ELFORA	40,000	40,000

Actual fixed costs of the power plant were $1,000,000 in 2008; actual variable costs, $2,000,000

Required:

a. Calculate the amount of power costs that would be allocated to Midroc Gold using a single- rate method.
b. Calculate the amount of power costs that would be allocated to Midroc Gold using a dual- rate method.

2. Lee Company has a small factory with two service departments and two operating departments. The service departments, Power and Maintenance provide support to the operating departments and also use some of their own services. Budget estimates are provided in the following schedule:

Support Department		Operating Department		
Power	Maintenance	Cutting	Assembly	Total

Budgeted factory

Over head costs

Before any inter

Department cost

Allocations	$100,000	$40,000	$200,000	$160,000	$500,000

Support work furnished:

By Power:

Budgeted kilowatt

Hours	_	100	600	200	900
Percentage	_	11.11%	66.67%	22.22	100%

By Maintenance

Budgeted Maintenance

hours	20	-	150	100	270
Percentage	7.41%	-	55.55%	37.04%	100%

NB. Power costs are allocated using kilowatt hours. Maintenance costs are allocated using maintenance hours.

Required: Allocate service department costs using

a. The direct method
b. The step- down method

3. Phoenix Consulting provides outsourcing services and advice to both government and corporate clients. For costing purpose, Phoenix classifies its departments into two support departments (Administrative/Human Resources and Information systems) and two operating departments Government consulting and corporate consulting). For the first quarter of 2005 phoenix incurs the following costs in its four departments:

Administrative/ Human Resource (A/H)	$600,000
Information systems (IS)	$2,400,000
Government Consulting (GOVT)	$8,756,000
Corporate Consulting (CORP)	$12,542,000

The actual level of support relationship among the four departments for the first quarter of 2005 was:

		Used by			
		A/HR	IS	GOVT	CORP
Supplied	A/HR	_	25%	40%	35%
By	IS	10%	_	30%	60%

The Administrative/ Human Resource support are based on headcount. The Information Systems support percentage is based on actual hours of computer time used.

Required: Allocate the two support department costs to the two operating departments using:

a. Direct method
b. Step-down method (allocate Administrative/ Human Resource first)
c. Step-down method(allocate Information systems first)
d. Reciprocal method

Chapter 7

Cost Allocation-Joint products and by products

Learning Objectives:-

At the end of this session you should be able to:

- Define a joint product and give an example
- Differentiate the different method of allocating joint costs
- Explain why joint costs should be allocated to individual products
- Identify the split-off point(s) in a joint-cost situation
- Identify the distinction between joint products and By- products

8.1 Introduction:

In many industries, two or more products are unavoidably produced from the same process and same raw materials. These products are produced in natural proportions which can not be changed at the will of the management. For example, in an oil refinery, when crude oil is processed, many products are simultaneously produced from the same raw materials. Examples of these products are: petrol, kerosene, diesel, grease, etc. Such products are known as joint products or by-products..

Definition:

Joint products are two or more products that are produced simultaneously from the one production process. Joint products, thus, represent two or more products separated in the course of processing, each product being in such proportion and of such a nature that no single one of them can be regarded as the main products.

Characteristics: characteristics of joint products are:

(i) Joint products are produced from the same raw materials in natural proportion.
(ii) They are produced simultaneously by a common process.
(iii) They comparatively of almost equal value.
(iv) They may require further processing after their point of separation.

Examples of entities that manufacture joint products:

Entity	Main products	By-products
Shell oil	Petrol, diesel, jet fuel	Asphalt
Flour mill	White flour, brown flour	animal feeding stuff
Cheese	Fresh cheese, butter	Butter milk

8.2 Joint products and co-products

Joint products should be distinguished from co-products .Co-products refers to more than one products being manufactured by a company but need not necessarily arise from the same raw materials and manufacturing process and the quantity of each product can be changed by the management. For example, in a bakery the various co-products are bread, cake, biscuits, etc. and the quantity of each such product may be change by the management as per needs.

8.2.1 Joint costs and subsequent costs

Joint costs /or common costs/ are all manufacturing costs incurred before that stage in manufacture at which the products get separated .i.e. they are common to all joint products and incurred prior to the split off point.

Definition: Split-off point is the stage in the production process where the joint products are identifiable as separate product.

Subsequent (or attributable) costs, on the other hand, are those costs which are incurred after the separation or split-off point. They are in ceremonial costs which can be easily traced to each specific product. They are relevant costs in sell or process further decision.

The distinction between joint costs and subsequent costs is important because when accounting for products, the joint costs are the main problem. This is because joint costs cannot be traced to individual products.

Activity 8.1 Explain why joint costs are irrelevant in a sell-or-process further decision

8.3 Accounting for joint products

Accounting for joint products means the apportionment of joint costs to each of the joint products. Such apportionment serves the following objectives:

(a) To determine the cost per unit
(b) To help in venture valuation
(c) To determine the profit or loss on each line of product
(d) To determine the price of each product.

The Various methods of apportionment of joint costs discussed below are based mainly on individual opinion and tend to produce only approximate result. This is because no perfectly logical basis exists for the apportionment of joint costs to products and most of the methods are arbitrary.

Methods of allocation /apportionment/ of joint costs are:

(1) Relative sale value

(2) Physical unit method

(3) Net realizable value method

(4) Reverse cost method

(5) Average unit cost method

(1) Relative sales value

A method of allocating joint costs to joint products in proportion to their sales value at the split-off point i.e. the apportionment is done on the basis of weighted sales value (number of units produced and sold times selling price per unity).

The allocation of joint production does not make it a relevant cost. Because that cost remains fixed despite the decision to process it further. The method is illustrated below with assumed figures:

Illustration 8.1

Example Product	Selling price Per unit **(a)**	Production quantities / unit/ **(b)**	Sales value (a)*(b) **(c)**	Apportioned Joint cost. (24 :48 :28**)(d)**
A----------	12	200	2400	2160
B----------	8	600	4800	4320
C----------	4	700	2800	2520
			10,000	9000

Working Note

Apportioned cost ratio =individual product sales value

Total sales Value

For product A= 2400 =24%
10,000

Fop produced B= 4800 = 48%
10,000

Fop produced C= 2800 = 28%
10,000

Apportioned Joint cost = Apportioned cost ratio * total joint costs

For product A Apportioned joint cost = 24% * 9000

= 24/100 * 9000

= $2160

For product B Apportioned joint cost = 48% *9000

= 48/100 *9000

= $ 4320

For products apportioned joint costs = 28% * 9000

= 28/100 * 9000

= $ 2520

(2) Physical unit method

It is a method of allocating joint costs to joint products based on some physical characteristics of the joint products at the split-off point. This means that the joint cost is apportioned on the basis of relative weight, volume or quantity, etc of each product obtained at the point where the split-off occurs.

Illustration8.2

The following data have been extracted from the books of international chocolate company.

Joint cost	Joint product	Weight at Split-off point	relative proportion	Allocation of joint cost
$1100 {	Cocoa butter	750 kg	¾	$825
	Cocoa powder	250 kg	¼	$275
		1000kg		$1100

Working Note:

Allocation of joint costs for cocoa butter = Relative x Joint cost proportion

= (750) x 1100

1000

= ¾ x 100

= $ 825

Allocation of joint cost for cocoa powder = relative x joint cost proportion

= (250) x 1100

1000

=1/4 x1100

= ¼ x 1100

= 275

(3) Net realizable Value method.

A method of allocation joint costs to the joint products according to the relative size of the final products net realizable values.

Steps:

- Calculate the net realizable value of the individual products
- Calculate the relative proportion based on the net realizable value
- Allocate joint costs to products

Net realizable value = sales value of final product-separable cost of processing

Illustration 8.3. The following data have been extracted from the books of Coke co. Ltd. Joint

Joint Products	Sales value of final Product	Separable Cost of processing	Net realizable value	Relative Protection	Allocation of Joint cost
$1100					
Tanning cream	$3000	$1560	$1440*	6/11	$600
Instant cocoa mix	$2000	$800	$1200*	5/11	500

Total joint cost allocated……..$1100

Sales value of final product-separable cost of processing = net releasable value

$300-1560 = $1440

$2000-800 = $1200

(4) Reverse cost method

In this method the joint cost is apportioned on the basis of net value of each product. The net value is calculated on the basis of net value of each product. The net value is calculated by deducting the following from the sales value.

(a) Estimated profit margin
(b) Selling and distribution costs, if any
(c) After split-off processing costs.

The net value of individual products so obtained is taken as the basis for apportioning joint costs. This is known as reverse cost method because net values are calculating by working backward from sales values.

This method is particularly used when product are not sold at their stage at split-off point but require further processing. Operation of this method is illustrated below.

Illustration 8.4. Assume in processing a basic raw material, three joint products 'x', 'y' and 'z' are produced. The joint expenses of manufacturing are: materials $10,000, lab our $ 8000, overhead $ 9000 (total $ 27,000) . Subsequent /separable/ costs are as follows.

	Products		
	X	Y	Z
Material……..$2000		……$1600	$1,800
Labour……	2500	……...1400	1,700
Overhead……...2500		……1000	1,500
Total	7000	4000	5000
Sales value……...	42.000	20.000	18.000
Estimated profit on sales	50%	50%	33 1/3 %

Required: Show how you would apportion the joint costs of manufacture by re verse cost method.

Solution: ***statement of Apportionment of joint costs***

	Products		
	X	Y	Z
Sales value…… .	42,000	20,000	18,000
Less: Estimated profit……	21,000	10,000	6,000
Estimated total cost	21,000	10,000	12.000
Less: Subsequent cost	7,000	4,000	5,000
Joint cost($27,000)… .	14,000	6,000	7,000

(5) **Average unit cost method**.

In this method, the joint cost is apportioned by using the average unit cost which is obtained by dividing the total joint costs by the total number of units produced of the entire product. The average cost per unit of each product is the same. The procedure is illustrated as follows.

Illustration 8.5 from the following particulars, find out the cost of joint products X, Y and Z under the average unit cost method

(a) per-separation point costs $ 30.000

(b) Other production data,

Product	**Unit produced**
X ……....1000	
Y…….....400	

Z……. 600

$2000

Solution:

Average unit cost = Joint Cost

Total No of unit produced

= $30.000

2000 unit

=**$ 15**per unit

Statement of Apportionment of Joint Cost

Product	**Unit**	**Average cost**	**Apportioned Cost**
	(A)	(B)	AxB = C
X	1000	$15	15,000
Y	400	15	6000
Z	600	15	9000
Total	2000		30,000

8.4 BY-PRODUCTS

By- Products are products of relatively small value which are incidentally and unavoidably produced in the course of manufacturing the main product. For example in sugar mills, other main product is sugar. But baggasse and molasses of comparatively smaller value are incidentally produced and thus are by-products.

By-products may be:

(a) Those sold in their original form without further processing

(b) Those which require further processing in order to be saleable

8.5 Distinction between Joint products and By Products

There are no hard and fast rules to distinguish between joint products and by-products. A product may be treated as a by-product in one business and the same product may be treated as a joint product in another business. However, the following factors should be considered to determine if a product is a joint product or a by-product.

(a) Relative sales value

If the sales values of the entire product are more or less equal, they are treated as joint products. If however, there is wide difference in the relative sales values of products, the product with the greater sales value is treated as the main product and the products of lower value are treated as by product.

(b) Objective of manufacture

If the objective of manufacturing is product A, the unwanted product B and C be treated as by-product.

(C) **Policy of management**

The management may decide to treat a particular product as the main product and the other products as by products.

Summary

Joint products are two or more products that are produced simultaneously from the one production process. It consists of a main product with a high sales value as compared to other joint products. In other ways, a by-product is a product with a low sales value as compared to other joint products. The costs incurred in the production of joint products are known as joint costs. These costs are common to all the joint products and incurred prior to the split-off point. Joint costs are normally used for estimating cost of goods sold and value of inventory. Split-off point is the stage in the production process where the joint products are identifiable as separate product. The costs incurred after split-off point are called separable costs. They are incremental costs which can be easily traced to each specific product and they are relevant costs in sell or process further decision. The five most popular methods of allocating joint costs to joint products are: (1) relative sales value method, (2) physical units' method, (3) net realizable value method, (4) Reverse cost method, (5) average unit cost method.

Profit differs under each of these methods. None of these methods is accurate, because, the methods are arbitrary cost allocation methods. Allocated joint costs are unreliable for pricing as well as any other management decisions, because of their arbitrary nature.

Self Test Questions

A. True or False? Give reason in brief

1) Allocation of joint cost to joint and by products does not affect overall profit or loss.
2) There is no difference b/n joint product and co-products.
3) By –product may not have any realizable value.
4) Sales value is a method of allocating joint costs to joint products based on some physical characteristics at the split –off point.
5) Some outputs of the joint production process have zero sales value and no journal entries are made in the accounting system to record the processing of such outputs with zero sales value.

6) The estimated NRV is the expected final sales value in the ordinary course of business minus the expected separable costs of the total production of these products during the accounting period.
7) Under the benefits-received criterion, the physical measure method is less preferred than the sales value at split-off method. Because it has no relationship to the revenue-producing power of the individual products.
8) Joint costs incurred up to the split-off point are past (sunk) costs irrelevant to the decision to sell a joint (or main) product at the split-off point or to process it further.
9) Joint cost allocation is important in litigation involving one or more joint products.
10) Cost allocation is required for cost reimbursement purposes under contracts when only a portion of a business' products or services is sold or delivered to a single customer (government agency).

B : Choose the best answer among the following alternatives.

2) Why is the sales value at split-off method widely used?
   a) It is objective
   b) It does not anticipate subsequent management decisions on further processing.
   c) It uses a meaningful common denominator.
   d) It is simple.
   e) All
   f) None
3) Which method of allocating joint costs should be chosen where market prices exist at split-off?
   a) Physical measure method
   b) Relative sales value method
   c) Reverse cost method
   d) average unit cost method
4) The _____ measure method allocates joint costs to joint products on the basis of the relative weight, volume, or other physical measure at the split-off point of the total production of these products during the accounting period.
   a) Physical measure method
   b) Relative sales value method

c) average unit cost method
d) Reverse cost method
e) None

Answer question no. 4 & 5 based on the following data. ABC Company incurred $200,000 of joint costs to produce the following:

Product A: 10,000 units, 20,000 pounds

Product B: 10,500 units, 48,000 pounds

Product C: 11,500 units, 12,000 pounds

5) What are the joint costs allocated to **product A** using the number of pounds produced as the physical measure?

a) $120,000
b) 50,000
c) 130,000
d) 30,000
e) None

6) What are the joint costs allocated to **product A** and **product C** using the number of pounds produced as the physical measure?

a) $170,000
b) 150,000
c) 80,000
d) 68,000
e) None

C: Fill in the blank spaces

1) The ---------- product usually has a greater sales value than by – product
2) The cost incurred up to the point where individual products can be identified are called - - - - - - - costs.

3) Under - - - - - - - - - - method of apportionment of joint costs, the cost per unit of each product is the same.
4) The _____ is the juncture in the production process where one or more products in a joint-cost setting become separately identifiable.
5) _____ are all costs (manufacturing, marketing, distribution, etc.) incurred beyond the split-off point that are assignable to one or more individual products.

D: Theoretical questions

1) Define joint product and by – product
2) Explain briefly the method of accounting by – product
3) List the major characteristics of joint products.
4) Define subsequent costs and give an example as well.

E) Practical questions

Q1. Lubbucko Company incurred $200,000 of joint costs to produce the following:

Product A: 10,000 units, 20,000 pounds

Product B: 10,500 units, 48,000 pounds

Product C: 11,500 units, 12,000 pounds

(i) Assume the following sales values per unit: A: $10.00, B: $30.00, and C: $20.00

Required:

a) What is the sales value at split-off point?

b) How much of the joint costs are allocated to each product?

c) What are the joint production costs per unit?

d) Assume all of the units produced of B and C were sold. 2,500 units of A (25%) remain in inventory. What is the gross margin percentage of each product?

(ii) Assume that Lubbock Company can process products A, B, and C further into A1, B1, and C1.

The new sales values after further processing are:

A1: 10,000 × $12.00 = $120,000

B1: 10,500 × $33.00 = $346,500

C1: 11,500 × $21.00 = $241,500

a) Additional processing (separable) costs are as follows: A1: $35,000; B1: $46,500; and C1: $51,500. What is the estimated net realizable value of each product at the split-off point?

b) How much of the joint cost is allocated to each product?

c) What is the production cost per unit?

Q2. In a process line of **XY** co, three joint products are produced .for the month of many 1999, the following data were available.

	Products		
	L	M	N
Sales price per Kg	$5	$10	$ 20
Post – separation point cost	10,000	5,000	15,000
Out put in Kg	2500	1000	1500

Per- separation point costs amounted to $ 20,000. The pre- separation point costs are apportioned to joint product according to their weight. Your are required to prepare a statement showing the estimated profit or loss for each product and in total.

Q3. A coke manufacturing company produces the following products by putting 5000 tones of coal & 25 per tone in to common process:

Coke - - - - - - - - - - - - - - - - - - 3500 tones

Tar - - - - - - - - - - - - - - - - - - 1200 ‘’

Sulphate - - - - - - - - - - - - - - -	52 tones
Benzol - - - - - - - - - - - - - - - -	48 tones

Required: apportion the joint cost amongst the products on the basis of physical unit method

(Hint: Difference b/n total input of 5000 tones and total out put of 4800 tones is assumed to be a normal loss.)

Q4. From the following information find the profit made by each product apportioning joint costs on sales value basis:

Direct material -	$ 126,000
Power -	25,000
Petrol, oil Lubricant -	50,00
Labor -	7,500
Other charges -	4,100

	Product X	product Y
Selling costs -	$ 20,000	$ 80,000
Sales -	152,000	168,000