

I. INTRODUCTION

1. What Are Costs?

1.1. Costs are not figures. They are monetary symbols. Costs arise from cash expenditures, accruals, usage of items from inventory, and amortisation of capital expenditures over the life of an asset. A cash payment to a carpenter for repairing a broken door is a cost. Coal used from a storage pile becomes a cost when the coal is used. Accrual for a property tax gives rise to a cost. The annual depreciation of a machine is a cost.

1.2. Costs are weight of steel per locomotive, man hours per truck, pig iron, scrap iron, limestone and coal per tonnage of castings, the tonnage of alloy steels of different types per excavator, the tonnage of cement, iron girders and iron rods, bricks and mortars for a house built, the weight of ballast per mile of road, the percentage of efficiency of labour, and so on.

1.3. The Accountant merely expresses the work in terms of a common factor, i.e. money. There is nothing to be confused by accounting figures. We have to stick to the basic facts. The expenditure is to be watched and controlled before it is incurred at the point of incurrence, i.e. on the shop floor. Let us now consider the three constituent elements that make up the total cost:

- (i) The amount spent on direct materials accountable in the finished goods (material Cost);
- (ii) The amount spent on workers engaged in converting these materials into the finished goods (labour cost); and
- (iii) The amount spent to cover all related expenditures before, during, and after the manufacture of the product incidental to the management of the enterprise making and selling the product (overheads).

1.4. The total amount thus spent or incurred is known as total cost or cost to make and cost to sell. It includes all expenses right up from the point of purchase of raw materials till the time the finished goods are put in the possession of the customer and the money is realised, including the cost of estimating in Jobbing industries.

1.5. Let us take the example of a unit assembling regulators for ceiling fans. If the total cost of a particular type of regulator is Rs. 50/-, it is expressed as:

			Percentage
Direct Material	”	Rs.30.00	60
Direct Labour	”	Rs. 7.50	15
Overheads	”	Rs.12.50	25
Total Cost		<u>Rs.50.00</u>	<u>100</u>

1.5.1. This relationship, i.e. cost structure, however, varies from industry to industry and company to company, and even from product to product in multi-product industries.

2. Cost Consciousness

2.1. Before a material requisition is signed by a foreman, he has to think whether the quantity of the material noted on the requisition is really necessary. It is to see whether less material could be used; when the worker goes out to canteen for tea for half an hour, the machine tool remains idle and this means loss of production worth about Rs. 10 or Rs. 20; cost of oil per tonne of forgings may go up; ways are to be devised to regulate the heating; where two men can do a job half a dozen people sometimes do the same.

2.2. By simplifying procedures, work can be done by lesser number of men-in other words it can be done at a lower cost. This is what cost consciousness means. Cost consciousness depends entirely on the people who work in the organisation. People are the power behind the cost reduction drive. If their interest can be captured, the cost reduction programme ultimately succeeds .

3. Cost Reduction

3.1. "Cost reduction embraces -

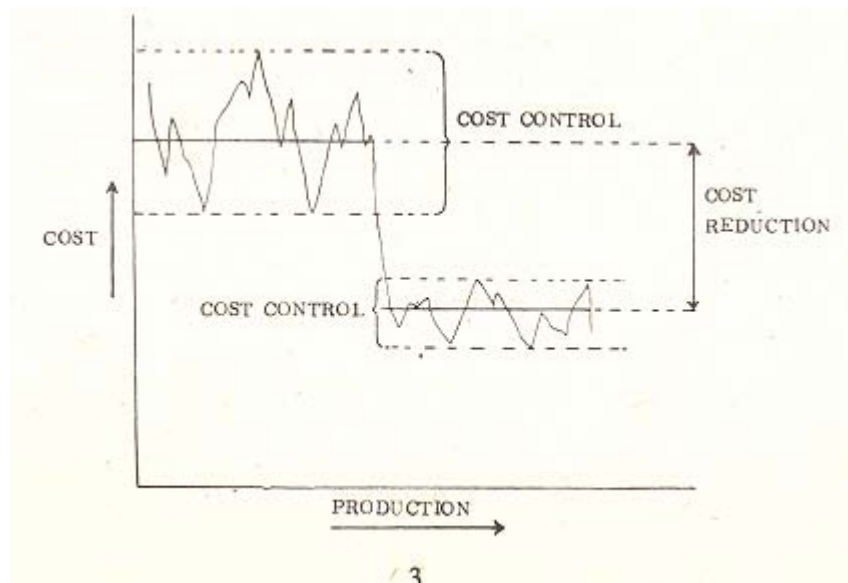
- (i) Unit cost reduction by expenditure reduction in respect of a given volume, of output; and/or
- (ii) Unit cost reduction by the increase in productivity (i.e. an increase in output, yield, or rate of output for a given expenditure)

3:Li. In practice, cost reduction will ultimately be achieved by a combination of these influences, and it will probably be impossible to assess the contribution which each has made to the overall savings".

3.2. Another way of looking' at cost reduction is to view it as the process whereby permanent savings are made without any reduction in the quality and/or usefulness of the products. There is developed an attitude of mind which challenges all standards with a view to their improvement. Cost reduction is 8: dynamic element essential in the operation of any successful business. It is not something used only in times of crisis, but is rather a continuous, organised endeavor, harnessing all available talent and facilities of a given company to reduce operating costs and thereby increase profits. A comparison of cost control and cost reduction shown in the tabulation given below may be of interest.

Cost Control	Cost Reduction
Concerned with adhering as closely as possible to the set standards	Concerned with genuine cost savings. Existing costs, including standards, are challenged in an effort to reduce them.
Standards are taken to be the desired state of efficiency.	Standards are regarded as yardsticks Which can be improved upon. They are viewed with suspicion.
Attempts to be guided by what is the lowest cost for the conditions which prevail.	Recognises that the operations of a company are dynamic in nature. For this reason changes in costs are expected.
Is generally effective only when some form of standards can be set.	Can be effective for all types of conditions. It is not limited to where standard costing can apply.

3.3. The difference between cost reduction and control is explained in the following figure:



3.4. "There is no standardised method which can be used for tackling 'all cost reduction problems. Much depends upon the nature and size of the reduction which it is hoped to achieve; what is certain is that some cost reduction programmes 'can be much more effective than others'. There are certain areas, where a small percentage reduction can yield an extremely large total cost reduction on an annual basis.' These areas must be recognised, and efforts made to bring about the desired results.

3.5. The emphasis on cost reduction should be on permanent savings. Cost reduction campaigns which are not carefully conceived and carried out are likely to be of limited value. Cost reduction should not depend upon personal whims; it should be planned so that the results are capable of calculation. If a component is eliminated altogether then this is a positive saving.

3.6. Another factor which should be considered is the effect the reduction of one cost will have on others. If lower paid workers are employed there may be a reduction in the volume of output. There would be no justification in eliminating an operation in one department if one or more additional operations were required at a different stage.

3.7. There is general recognition that crash programmes cannot usually produce economies which are of a permanent nature. On the other hand if a business is experiencing financial difficulties then a cost reduction campaign may serve a useful purpose in the short run. For effective cost reduction over a long period the campaign should be continuous. The obvious reason is that cost reduction actions require time to take effect. In the long run prices must be fixed and influenced by the cost of production.

3.8. Cost reduction is not something which one can buy off a peg or get from a vending machine by pressing a button. The golden key to cost reduction is intensive and logical thinking based on facts. Henry Ford has made a positive way of stating the cost reduction problem. He said: "Our policy is to reduce the price, extend the operations, and improve the article. You will notice that the reduction for price comes first. We have never considered any cost as fixed. Therefore, we first reduce the price to the point where we believe more sales will result. Then we go ahead and try to make the prices. We do not bother about the costs. The new price forces the costs down. The more usual way is to take the cost and then determine the price, and although that method may be scientific in the narrow sense, it is not scientific in the broad sense because what earthly use is it to know the cost if it tells you that you cannot manufacture at a price at which the article can be sold? But more to the point is the fact that, although we may calculate what a cost is, and of course all our costs are carefully calculated, no one knows what a cost ought to be. One of the ways of discovering this is to name a price so low as to force everyone to dig for

profits. We make more discoveries concerning manufacturing and selling under this forced method than by any method of leisurely investigation. "

4 Importance of Cost Reduction

4.1. Why should cost reduction be regarded as being of vital importance to a business? There are, 'in fact, many reasons why active cost reduction programmes should be followed at all times. Without them business is unlikely to survive. Once costs are saved they should be controlled at the new level until some method of reducing them still further is found.

4.2. A business has to deal with two aspects - costs incurred and revenue received. The difference between the two is profit out of which the following must be satisfied:

- (i) Shareholder
- (ii) Expansion of the business.

4.3. In addition, there is the question of dealing with pay claims which increase costs and reduce profits unless prices are increased. , Finally, there is the satisfaction' of the consumer. More profit can be earned by increasing the price, but in a competitive economy this practice cannot be regarded as sound policy. Even if consumers continue to buy the goods there is likely to be an increase in the prices of raw materials or the wages of employees. There is created a vicious spiral where product, price increases are followed by wage and other increased costs which in turn are followed by price increases.

4.4. Competition from within the economy affects the price that can be charged. If- too high,- products will not sell. There is also the question of selling abroad.

4.5. Cost reduction of a permanent nature. without any reduction in quality or usefulness, is the only solution which is unlikely to have adverse effects. In effect, cost reduction is profit earning: by reducing the cost side of the cost/revenue equation it is possible to increase the profit.

5. Areas of Cost Reduction

5.1. The real success of a business depends primarily on the efficient use of those basic, cost elements: by basic costs are meant the man hours of labour, kilowatt hours of electric energy, weights of raw material, etc., per unit of production of goods and services .

5.2. The first basic-cost reduction should be the elimination of waste all along the line from source to ultimate consumption or use. In general (i) unless there is a continuing improvement in quality, or (ii) a reduction in the amount of raw materials consumed per constant unit of production, (iii) a substitution of more plentiful for

scarce raw materials, or (iv) an increase in the weight or number of byproducts from the same weight of raw materials, the industry probably stands in need of technological improvement. The engineer can contribute quality improvement and elimination of waste in industry and should cooperate in curtailing losses in other fields.

5.3. Not only are materials wasted, but countless man hours are lost for a variety of reasons. Among these are poor personnel relations and failure to make the most of the individual employee's talents, training and inclination, inefficient management, and dispute between labour and management; accidents and illness failure to plan and execute the job properly the first time; and bureaucracy and pressure groups.,

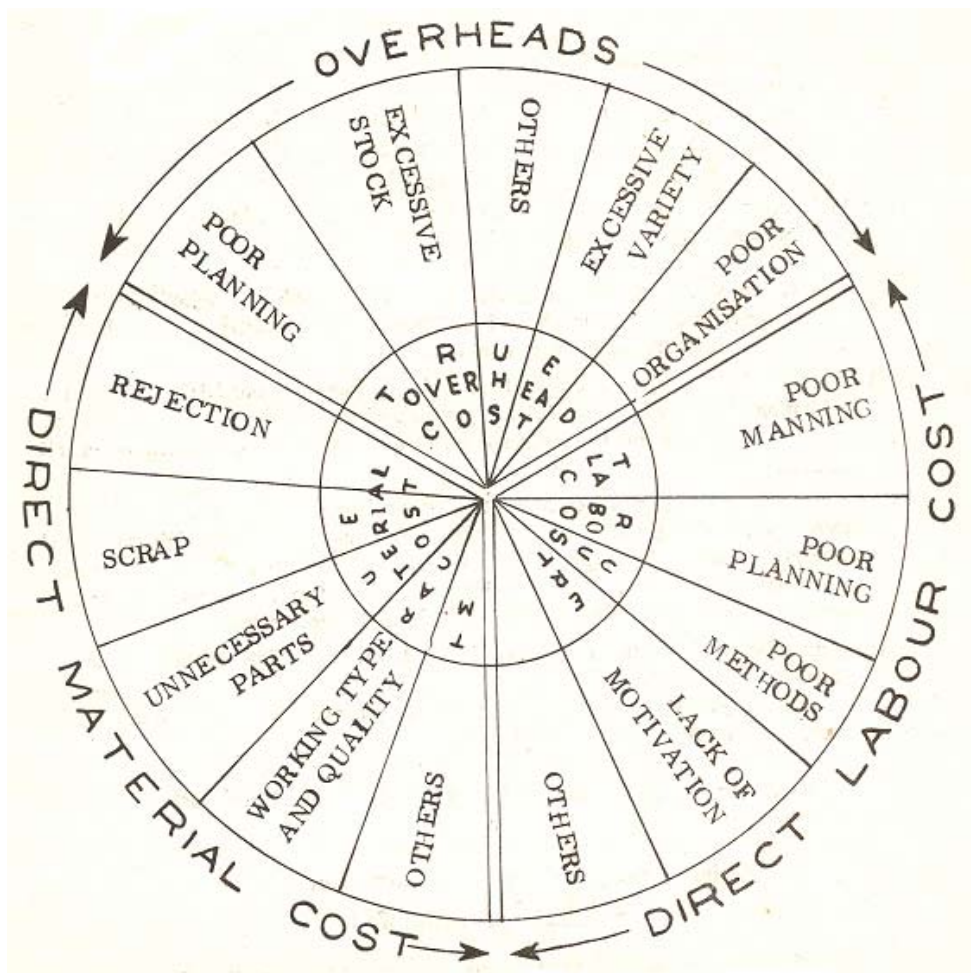
5.4. In addition to raw material and man hour losses, excessive use of utilities (electric energy, steam, water, etc.) frequently occurs. In fact it is exceptional to find an industrial plant where a reduction of utilities consumed per unit of production cannot be made. Of course, it should not be forgotten that increases in utility consumption are sometimes justified, e.g. an increase in electric energy to reduce physical effort and to make possible a higher output per man hour.

5.5. There are many ways in which industrial engineering know-how and procedures can be applied to basic cost reduction.

5.6. Cost reduction is not limited to engineering methods. Among others which have proved successful are the following:

- (i) Quantity output which permits overhead expenses and the various fixed charges to be, distributed over a very large number of units so that a low selling price can still allow for a reasonable profit margin.
- (ii) Specialisation in the manufacture of a commodity or commodities for which a plant is best fitted. Closely related is standardisation of both operations and types of goods produced, the first leading to methods simplification, and the second to elimination of unprofitable lines.
- (iii) Utilisation of byproducts is one of the most effective means by which costs can be reduced. It sometimes leads to a new industry or industries, and frequently permits the main product to be sold at a lower price.
- (iv) Integration of industrial processes under one management can reduce production costs through control of raw materials. and selling costs through elimination of middle men. (The benefits are not always passed on to the customer). Integration is not an unmixed blessing, and, to name but one possibility. the increased capital required may constitute a hazard.
- (v) If stock turnover can be increased, less working capital will be required. and unit costs can be reduced.
- (vi) Output per man hour is perhaps the most important single item in cost reduction, and one in which labor's and management's interests should be parallel. Higher output per man hour is a sound basis for increasing wages, and should lead to lower costs and broader markets.

- (vii) Closely related are output per unit of equipment and elimination of bottlenecks. The output of many a plant has been increased with additional facilities on manpower. sometimes even with a reduction in these, items by bringing all units into production balance, and by increasing the output per unit.
- (viii) Equipment utilisation has a direct bearing on unit costs. Taxes, depreciation, interest on investment. and many general and administrative expenses continue whether the equipment is fully utilised, or not. The ideal is 100 per cent equipment utilisation. although this cannot be attained in practice except for limited periods of time.
- (ix) Control of inventories of raw materials, semi finished and a finished goods IS essential in a well-managed business. Purchasing should be governed by business conditions and anticipated manufacturing. requirements and inventories held at various levels deterlllined by current mares demands. Speculation in inventory appreciation is hazardous, and bas no place in manufacturing.



Constituents of total cost with probable reasons for excessive cost

5.7. Basic cost reduction is the responsibility of all who derive profit from the use of the country's basic resources-consumer, labour management and government. Working in harmony, these four groups can raise material standards of living to new and higher levels. Working at cross purposes, it will be difficult to maintain the present standards.

6. What to Reduce

6.1. In our example of regulation of ceiling fans we found that material cost is the major cost element. Evidently the Company must aim at a material cost reduction first. Let us now figure the total cost of the regulator in: the form of a circular or pie chart (see page 7), and then consider as how to reduce the excess cost in each of the cost elements ...

7. Material Cost Reduction

7.1 In a manufacturing industry, material takes a major share (50 to 70%) of the cost. Hence there is maximum scope for cost reduction in this area. It is apparent from Fig. I that to the true basic cost of material, costs are added due to various factors which could be controlled by the proper use of techniques available to the management. The following are a few illustrations:

- (i) In a rubber works, manufacturing caps for penicillin vials, the rejection for various reasons was found to be as much as 38%. Hence the direct material cost of this product for this factory is 60% higher than what it ought to be.
- (ii) A maker of wiring clips was using a 1.5/8" strip for punching out 1.1/2" clips, and the utilisation of material was only 40%. By using a wider strip and punching out two clips in the opposite direction this company was able to increase the utilisation of material to 81%.
- (iii) At the Pontiac Division of General Motors, the original design for the manufacture of recoil spring casing for an automatic aircraft cannon, required a 6 lb. casting to be machined from a 56 lb. forging, 50 lb. of steel clips going to scrap. The new design was to weld a steel tube to a 14 lb. cylindrical forging from which only 8 lb. of metal has to be removed, i.e. a 75% reduction in the cost of direct material.
- (iv) A manufacturer of electronic equipment in Bombay found by investigation that he could obtain an 18.8% saving in the component cost of unitised Gamma Ray Spectrometer
by eliminating a few of the components and substituting cheaper ones for others without affecting the quality of the instrument.

7.1.1. The above examples will show that the direct material cost is to a great extent enhanced by:

- (i) Defective design of the product and its components,
- (ii) Wrong selection of raw material in terms of type or of quality, and
- (iii) Poor manufacturing methods leading to excessive scrap and rejection.

7.2. We must understand, therefore, that even though higher cost through direct material is attributed to the shop supervision, the foreman has limited chances of controlling material costs. All he can do is the prevention of scrap and waste. It is the responsibility of the designer or the engineer to specify the type of materials and tools to be used which will lead to a lower basic cost of material. Also, it is the Purchasing Department or the buying section which can control the prices paid for them and secure maximum value for the money paid. The responsibility for controlling material can be divided amongst:

- (i) The designer-for reducing the basic costs,
- (ii) The purchasing officer-for reducing the price paid, and
- (iii) The foreman-for reducing scrap, rejection, and wastage in use.

7.3. Probably the greatest scope for cost reduction throughout industry lies at the stage of product design. The cost of manufacturing, warehousing, and distributing, will depend greatly on the decisions taken at this stage. The far-reaching effect of design upon product cost makes it imperative that systematic consideration should be given at this stage to all aspects contributing to its cost. Some of the factors are:

- (i) Standardisation and variety reduction;
- (ii) Compactness of the finished product leading to economy of packing and transportation;
- (iii) Use of materials considering their cost, machining and handling property, yield factor, and storage requirements; and
- (iv) Influence of design upon manufacturing cost in terms of tolerances, tools, jigs and fixtures, and processing time.

7.4. Once the designer has decided on the parts and components of the product, and the materials to be used based on the above considerations, and their relative economy, it is left to the purchase section to buy it from the most competitive supplier.

7.5. Value Analysis is concerned with a detailed discussion of the price of every component of the finished product purchased or manufactured to find out whether the best value for the money spent on it is obtained. Application of Value Analysis for purchasing has reduced the prices of items in many instances by 70% to 90 %, 40% being quite common..

7.6. Some of the examples cited above show poor utilisation of material. due to excessive scrap and rejection. Hence the control and reduction of usage of material in industry merits a very thorough inquiry by the cost reduction team. To start with, a study of the, yield, i.e. the relationship between the gross weight of materials purchased and the net weight of the, finished product may point the way for further

investigation into process inefficiencies. This may lead to the recognition of wastage of material at various stages, and their elimination by using:

- (i) Material of proper size and type,
- (ii) Adequate but not excessive manufacturing tolerance,
- (iii) Better equipment,
- (iv) Better training of workers,
- (v) Better operating methods,
- (vi) Adequate supervision, and
- (vii) Adequate stage inspection

8. Labour Cost Reduction

8.1. Even though material cost reduction was presented as the most potential area for cost reduction due to being a major part of the cost in 'manufacturing industries, labour cost control has received more attention due to its easiness to handle. Another reason for its receiving favorable consideration from management and consultants is the extent to which reduction is possible. While material cost could be reduced from 60 % to 50 % or even 40%, labour cost with mechanisation can: be almost brought down to 5% to 10%.

8.2. It can be seen from Fig. I that the direct labour cost normally shown on the cost sheet includes true labour cost (payment for the time booked) which cannot be reduced and a major portion of costs added due to various factors, such as poor manning, poor planning, poor working methods, and lack of motivation:

8.2.1. Poor Manning: In many industries work study and labour control techniques have received favorable attention, because the management is aware that they are burdened with more men. More men as a result of poor manning policy also lead to lower wages since a company's total wage bill is limited by its ability to pay. Poor manning does not just mean excessive men, since there are cases where inadequacy of men of required skill has led to a lower productivity and a higher cost.

8.2.2. Poor Planning: No proof is required to show that bad planning of work orders adds to idle time of men and machines. Lack of raw materials of the required quality, at the right time, and at the right place, also due to defective planning, adds to labour cost by increasing the ineffective time of men. In to the influence of poor planning on labour cost can be summarised thus:

- (i) Nonavailability of men of the required skill when needed.
- (ii) Nonavailability or inadequate supply of material.
- (iii) Nonavailability of equipment and tools when required.
- (iv) Nonavailability of work when other facilities are available

8.2.3. *Poor Methods:* Work content and hence labour cost of almost every job in the industry is enhanced by inefficient methods of manufacture or operation. The following, among many other factors, lead to excessive amount 'of mail hours wasted or interactively utilised:

- (i) Defective design demanding removal of excessive material;
- (ii) Wrong machines and tools used leading to a lower output;
- (iii) Process not operating properly, i. e. equipment run at sub-standard feeds and speeds;
- (iv) Bad layout of factory, shop, or workplace leading to excessive movement of men;
- (v) Too tight tolerance and quality standards demanding great care on the part of the operatives, and leading to more rejection and reprocessing; and
- (vi) Bad working methods of the operatives causing wasted motions and ,efforts.

8.2.4. *Lack of Motivation:* Another factor which adds up labour cast is the attitude _ of the worker himself due to lack of proper motivation. Management by Proper planning can provide work, material, and equipment, but if the man is not" willing, return on the labour investment will be much below standard.

8.3. The solution to a reduction 'of labour' cost lies in the elimination of the factors enumerated before as leading to poor utilisation of manpower. To summaries, labour productivity can be enhanced, and labour cost consequently reduced, by:

- (i) *Reducing the work content of jobs:* This can be achieved by
 - (a) Modifying the product design;
 - (b) Providing adequate tolerances;
 - (c) Eliminating unnecessary activities;
 - (d) Rearranging and combining necessary activities; and
 - (e) Improving the materials and equipment used.
- (ii) *Providing adequate work:* Proper sales forecasting and planning of 'production' can even ups and downs in production demand, and provide a steady work for the men employed; Also of great importance is the provision of only the required number of men for the work.
- (iii) *Recognising extra effort:* Recognition plans,-like Merit-rating” for the purposes of giving .merit-increment and,proltotions, incentive:scllemes

for paying a man according to his contributions of work and suggestion system to share. the gains of experience and participation can provide the required pep for men to work and meet the standards or . the iev1 of performance established by management techniques like Work Study.

- (iv) *Worker Working:* The most important of all is the willingness of the worker to work' productively for a greater proportion of the time, and an understanding that the industry is dependent on his work and not his presence.

9. Overheads

9.1. Overhead cost in almost every industry is excessive. This may be attributed the factors like poor planning, poor inventory policy leading to excessive stocks of raw material, finished goods, tools and spare parts, lack of standardisation, and poor organisation.

9.2. *Poor Planning:* Poor planning adds up unnecessary overhead expenses also in addition to direct material and labour costs. It is regrettably true that management's concern for efficiency in manufacture often appears to be contained to the never obvious factors like production methods, factory layout, and operator efficiency, while other potential sources of considerable savings go untapped. A few of these sources are:

- (i) The supply and utilisation of power, fuel and water;
- (ii) Maintenance;
- (iii) Inspection;
- (iv) Clerical services; and
- (v) Personnel services.

9.2.1. Only when these services are recognised as important areas of expenditure and potential sources of cost reduction, and accorded the same enthusiastic interest as other branches of industry, can the objectives of a cost reduction programme be fully achieved.

9.3. *Inventory Control:* The importance of stock control arises from the demand which investment in stock spaces upon the available. liquid capital. . It is of far greater significance from the point of view' of cost reduction by virtue of the fact that stocks can give rise to the following sources of cost:

- (i) Storage cost,
- (ii) . Handling cost,
- (iii) Stock-taking and other clerical expenses,

- (iv) Deterioration and its prevention,
- (v) Pilferage,
- (vi) Insurance and stock room security, and
- (vii) Obsolescence.

9.4. *Standardisation:* The effects upon costs and the general manufacturing efficiency of a wide diversity of products, components, equipment and methods are sufficiently important to warrant special consideration of this factor.

9.4.1. A reduction in variety means longer runs with fewer changes on the production line, more mechanisation, higher productivity, and lower unit cost.

9.5. The wheels of industry turn to the orders of many persons having various degrees of authority, and the contribution that a properly defined chain of Responsibility and channels of communication can make towards a reduction of costs difficult to measure.

9.6. Finally, cost reduction and control is a continuous process, and a programme once commenced should be co-ordinated and controlled, lest the benefits achieved by improved performance may easily be dissipated.