Product Design and Manufacturing

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Lecture - 18
Product Costing

Welcome to lecture number 18. In this lecture we will be more focused towards product costing.

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Costing is very important phenomena, because it decides the success of a product. When a customer goes to a market and buy the product, apart from its performance, he also keeps cost as one of the major objectives to be met. So, in this lecture we will focus little bit on introduction followed by, it will be cost and price structure, then information need sources, then estimating direct and indirect costing, design and manufacturing costing and ways to model manufacturing cost.

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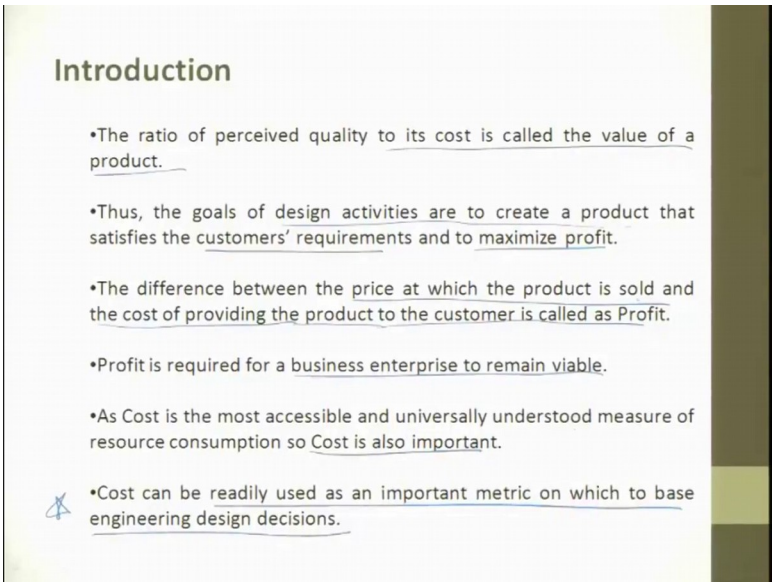

The ratio of perceived quality to its cost is called the value of the product. Thus the goal of design activities is to create a product that satisfies customers requirement and to maximize product. So, any company which comes into market, so they always try to maximize their product, the profit. So, when they try to maximize their profit, they also must keep in their mind that customer requirement is all met. See, there are two three ways of strategy forming; one strategy is use, sell very small number of plots or products and make your profit. The other way around is sell more number of products, have a smaller margin in each product, but sell more in numbers, you still make your total gain, whatever it is. The third one is, you try to which is not ethical, you try to cheat a customer and all you have to do is, cheat him only once.

But you cheat more number of customers and the product dies off after one sale; that is the third side strategy, some companies do follow, but that is not an advisable strategy. We will always look for the first and the second, sell lesser number, have very high quality, make profit, sell more in number, have very small profit, but since you are sell more in number, you also still make the same profit. Within this, you have to make a strategy and then start doing it, but whatever you do, the company wants to make a profit, but the profit cannot be sacrificing customer's requirements.

The difference between the price at which the product is sold and the cost of product providing the product to the customer is called as the profit. So, the difference between

the price at which the product is sold and the cost of providing the product to the customer is called as profit. A profit is required for business enterprise to remind viable. See nobody will make a product, no company will make a product, where and which the product is not making profit just for sustaining. If somebody makes a loss in the initial few days of the product establishing that is ok, they have a business strategy, but this cannot be done for a long time, or I will put it in this way. No product is sold for zero profit, as cost is the most accessible and universally understood measure of the resource consumption. So, cost is very important.

Many a times we talked about performance, we talked about quality so, but this performance and quality are indirect measure. Quality, you always say, if the quality is met the customer is satisfied or customer is happy. So, what is this happiness, I cannot quantify. If the performance is very good, what is the performance, how can I evaluate the performance, it can be in terms of energy reduction or it can be in terms of cost, but measure which is directly accessible by everybody and accepting by everybody is costing. So, costing can be readily used as an important metric on which to base the engineering design decision.

So, this point says very clearly that costing is very important, the difference between the price at which the product is sold, and the cost of providing the product to the customer is called as profit.

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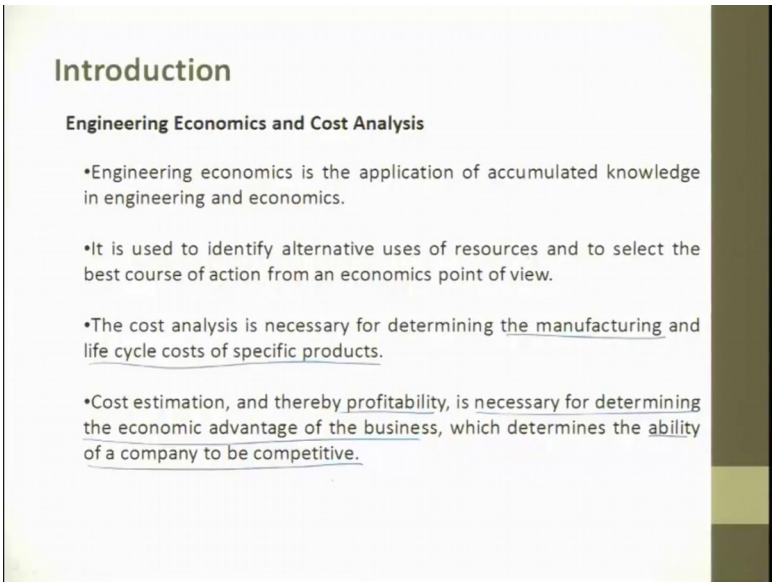

Engineering economics and cost analysis engineering, Economics is the application of accumulated knowledge in engineering and economics, it is used to identify alternative use of resources and to select the best course of action from an economic point of view. For example, a chair can be made out of steel, a chair can be made out of wood, a chair can be made out of plastic. So, what we look forward is, how do you decide wood, plastic or steel. So, this choice is made on top of engineering, where and which economics is also kept a major point.

The cost analysis is necessary for determining the manufacturing and life cycle cost of the specific product, cost estimation, and thereby profitability, cost estimation is different, profitability is different. Cost estimation and thereby profitability is necessary for determining the economical advantage of the business which distance, which determines the ability of a company to be competitive. If a company is competitive in the market, it has to have regularly assessing the product, performance and the cost, then decide what is to be done.

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Cost and price structure,

(Direct labour cost) + (material cost) = (prime cost/operational cost).

Direct labour cost is cost of the actual labour used to produce the product. So, since the labour cost is going very high, today there is lot of demand for automation. So, people

look for automation and robotics, as a big field where and which they try to replace the human labour. The direct material cost comprises the cost of raw material or semi finished material that can be directly attributed to the product.

(Factory overhead) + (prime cost) = (cost of the goods manufactured / Manufacturing cost),

whereas something called as overhead cost.

So, overhead cost is indirect material cost, factory supplies, lubricants, indirect labour cost, cost of a supervisor inspection, salary of a factory club, fixed and miscellaneous cost; such as rent, insurance, tax, depreciation, maintenance, repair, utilities and small tools. All these things fall under overhead cost. When you go to a shop or canteen or when you go to a hotel, the bill which is getting generated where and which we use a paper which is nothing, but an overhead cost, you cannot live without a paper. Today the scenario has come to such a good extent that what they do is, even the bills what you eat are getting transferred through mobile phones.

So, like what you have in Ola and Uber, the same way, as soon as you finish your dinner the bill comes on to your cell phone and then you go to the counter, pay that money or you can pay through PayTm directly. So, that is what is the new advancement. So, there the paper what we used is an overhead. So,

(direct labour cost; material cost) = (prime cost) / (operational cost). What is direct labour cost you have seen factory overheads, you have seen all the factory overhead here.

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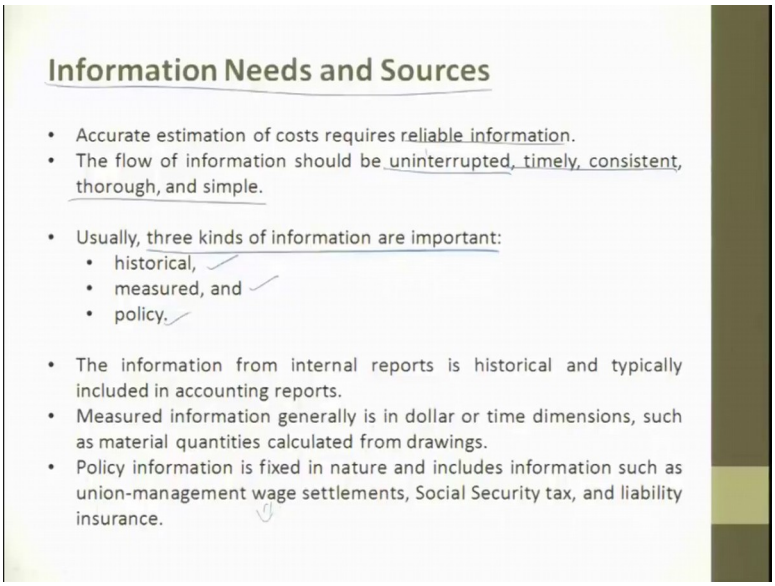

The information needs and resource and sources. The accurate estimation of a cost requires reliable information. So, you cannot do lot of approximation. For example, when I start talking about pharmaceutical industry for tablet, they talk about a profit of 2 paisa 3 paisa. So, that is the profit margin they talk about here, they have to boil and mail down to the last decimal point or take it to the last level and do all the cost estimation very precise ok. The flow of information should be uninterrupted, timely, and consistent throughout and simple. See today we talk about digitization in a big way. So, the digitization, it's trying to reduce the time and it is also talking about using a data source which is consistent ok.

So, the flow of information should be uninterrupted, timely, consistent, thorough and simple. Usually three kinds of information are important; one is historical, measured and policy. Historical is what is a sell last year and what is the measures we have taken in this year, and policies are what are the government policies which is given for this discount and other things. The information from internal report historical and typically included in accounting information. measured information generally is in dollars or time dimension such; such as material quantities calculated from the drawing ok. So, that is measured information. Policy information is a fixed in nature and includes information such as union management, wage settlement, social security, tax liability insurance, etcetera, etcetera.

For example, the weights, every year there is a government policy; they revise the minimum wage for daily wage worker, and this they have in, in India there are two systems followed; one is central government wage minimum wages and state government minimum wages. So, there are two things, an industry or an organization can decide which one do they follow and which one they have to, and then they follow one have to complaint to the complete thing. So, these are all policy decisions and every year or once in 5 years, there is a revision in the salary. So, this once the salary increases, it has to be increased for all levels of skilled people, skills in the factory. So, that is a policy information.

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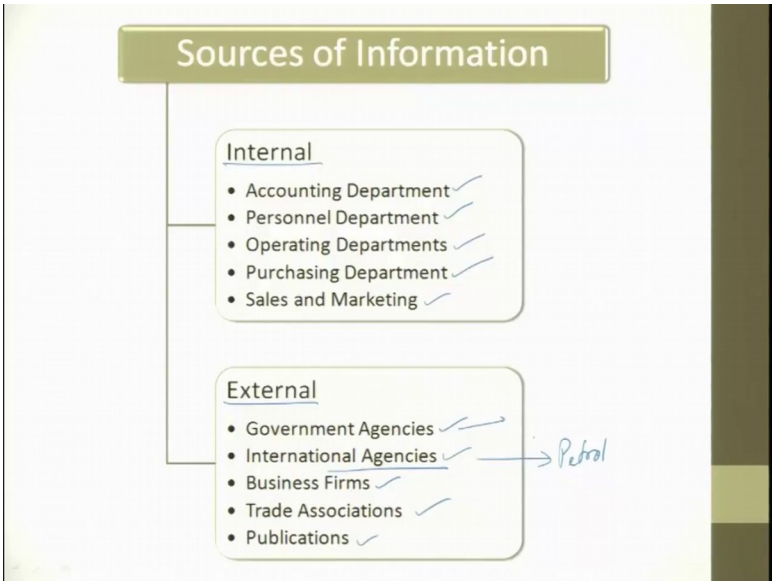

The sources of information there is access at internal as well as external is there. Internal information is accounting department, personal department, operating department, purchase department, sales and marketing. Accounting department is way talk about what is the cost, today I invest the capital into this, product to be bought. So, when will I get back my capital, and when I put this capital and everyday it also has interest. So, when will I get back the interest? Certain interest, certain the capital money can be borrowed certain you have your own money so you're trying to reinvest.

So, that information is called as accounting information, where department gives. Then personal information how many people involved in that. Operating department try to say, whether we can subcontract this or whether we can try to produce everything inside. So,

that is what is the operating department says, how many staffs required whether we should run in three shifts or not, when is the material to be procured, should we buy it and multiples of hundreds or should we buy what is the back size all those things are done. Purchase department decides whether it is to be done inland or it has to be imported.

Inland is within the country is production itself can I get it same or, can I get it from abroad for the cost whatever I can offered. Earlier it was talked about, when we try to buy it inland, the cost is going to be economical. Today the cost has become the, cost the technology so much developed, and the costing has come down drastically. Today we try to compete with international market. The international market products are comparable with that of inland.

So, those things and sales and marketing; all those things talk about the internal information which is to be added to the product costing when we talk about external its government agencies, international agencies, business firms, trade association and publications. They all are the external source of information which are to be added to, which are to be taken up when we decide the costing. When we talk about international agencies, see take a simple example of petrol or diesel today.

So, the diesel price is now become dynamic, and it depends upon the international market. So, there is a rise or a decrease depending upon the international agencies,not on the government policies, for one particular product as a petrol. Government agencies they try to, they try to decide and give that the depreciation and the interest labour all those things estimating direct and indirect cost.

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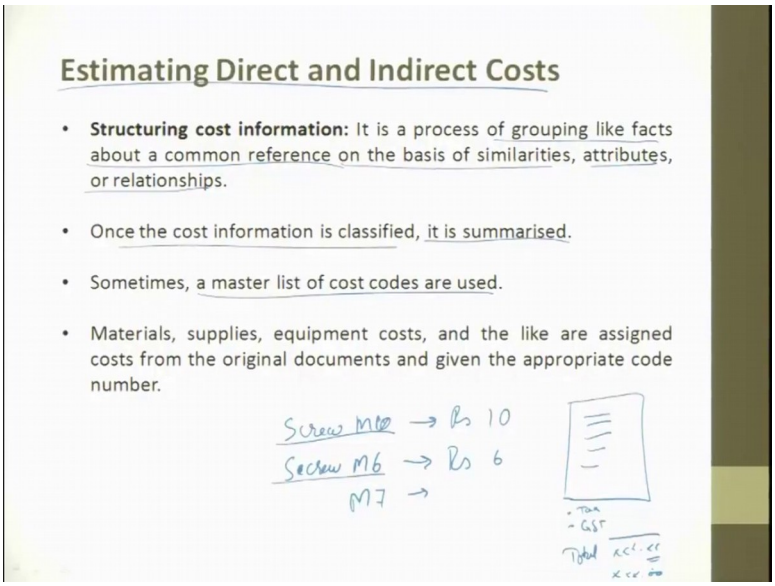

So, direct cost and indirect cost, direct cost are those cost where the material, where the material cost and the person who is involved in developing, they directly touch the product they are called the, costing which is involved is called as direct cost. Indirect cost or something like a supervisor purchased all those things are called indirect cost. The structuring cost information is, it is a process of grouping like facts about a common reference on the basis of similarities, attributes and relationship.

So, basis of similarities between the product attributes, so very fine colour, texture all these things are attributes and their relationships. Once the cost information is classified, it is summarized. Cost information is classified based upon whatever we have seen in the earlier slides. Sometimes a master list of cost codes is used. For example, if you know that a screw, a screw M10 screw, M 10 screw cost rupees 10. So, then a screw M 6 might cost something like 6 rupees. So, suppose if I do not have the costing or suppose if I decide to do, if I want to produce between M 6 and M 7 some screw or M 6 and M 8, I want to produce M 7. So, what it does is in the master file, I can see M6, I can see M6 and M10 and then I can try to take a price in between these two and then start putting it as a cost.

So, master list of cost codes is available and, and apart from that what happens when you try to see, you always see a price listing given for several products in a manual or in websites. So, these things are nothing, but master list of cost coding which are used,

materials, supplies equipment cost and the likely are assigned, cost from the original documents and giving the appropriate code numbers are there; for example, when you go to buy a pizza in a shop.

So, eat pizza has a code number. So, what they do is, they just punch the code number and then you see the rest of the cost coming up, and then when it is done, you can see apart from the costing, you have that all these say tax costing and then they put G S T, whatever it is and then finally, they say this is a totally X X X amount and if you see the denominator is a very difficult number to give a change. So, then also it approximate and it says X X X and then stops this two digits ok. So, all these things are structures of in costing.

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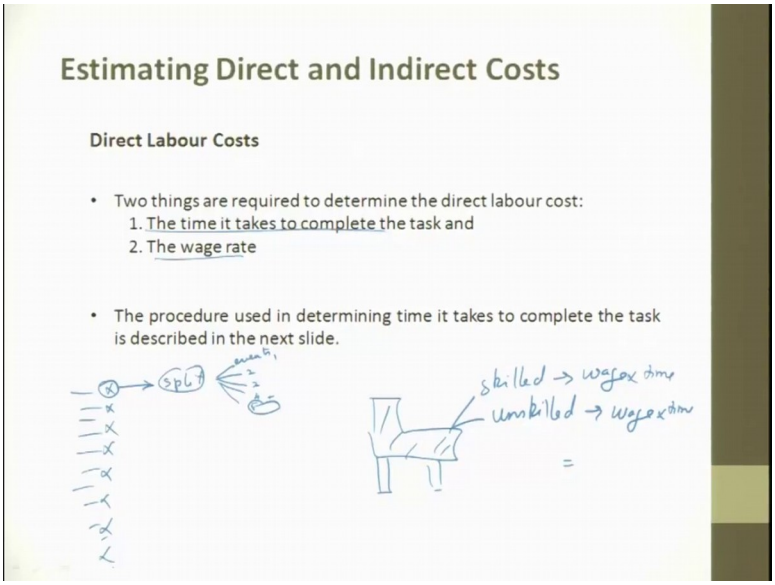

So, direct labour cost, two things are required to determine the direct labour cost; one is that time which is taken and second one is the wage; that is right. So, for producing a chair, a chair, you need a skilled labour, you need a semi unskilled labour. So, there is a wage for unskilled labour, there is a wage for skilled labour and what is the time required in converting a raw material into finish product. So, that is the time which we multiply and then we try to take the cost. So, this labour, this direct labour cost depends upon the skills he has, and depending upon the skill the wage differs ok. So, here the direct labour cost depends upon the time required on the wage require. The procedure used in determining the time, it is taken to complete the task is described in the next slide.

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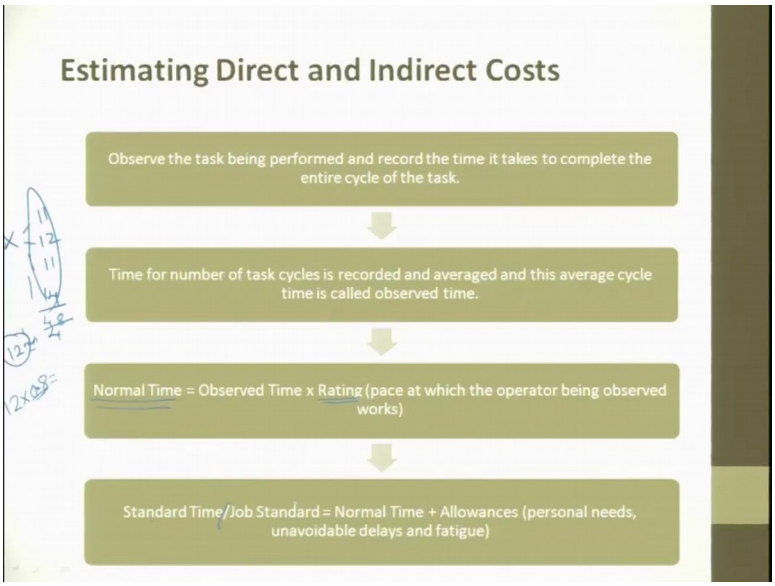

So, what you do is generally, suppose if there are some 20 events to be happened to convert your raw material into a finish product. So, each event we will try to split that event, split that event into several small sub events, and events we try to split 1 2 3 4 and 5. And now for each event I know what is a cycle time. So, then I add the cycle time, find out this major event, from here I try to find this event like this, I try to do 10 or 20 events to do one job, and finally, I tried to total this sum and then try to do it.

When I try to split smaller and smaller and smaller what happens is, there are standard which are established by industrial labour law organization. They have said that for this micro event what should be the time to be given. So, here what we do is the estimating the direct and indirect cost, observe the task being performed and record the time it takes to complete the direct cycle of the task. For example, if somebody is repetitively doing a job. So, what you doing, you will go there stand beside him and start recording, how many times he does the job in one shift, say for example, repetitive job he does in one shift.

For each job what is each time, when you repeat what is a time he takes. So, first what they say is they try to say please observe, then what they say is then time the number of task cycle is recorded and average and then average cycle time is called the observed time. So, what they say is for example, for doing X job, he takes 11 minutes 12 minutes, 11 minutes and then he takes 14 minutes. So, now, what they say is they say, add up all

these things, a simple thing is I said 10, so plus 1 plus 2 plus 1 plus 4. So, 1 plus 3 plus 1 4 plus 4 8 8 divided by 4 2. So, it takes 2, it takes 12 minutes; 48 divided by 4, it is 12 minutes. So, what have you done you have taken, the time taken for the same task to do 4 times and then you have averaged it out and then you have try to figure out this is 12, this 12 is called the observed time.

So, what is the normal time; normal time is nothing, but observe time into rating. So, what I do is, I do not take 12 minutes all the time, because if I do it a 12 minutes then we do not give any fatigue allowance. We do not give an allowance where and which he has to attend to his nature's call, we do not give a small, because if you do not give a relaxation, then that might lead to fatigue and tiredness and he does not perform very well or there is a possibility mistakes can happen. So, generally what we do is, we try to take 12 minutes, and then we multiply to the factor of called 0.8. So; that means, to say 80 percent of the time he will do it more focus; so 12 into 0.8.

So, that will be the normal time which is taken, places at which the operator being observed to work that is the, waiting to be always multiply with that and then what we say, this is the time which you take for a cycle time, then what we do standard time divided by the job standards, that is nothing, but normal time plus allowance we give. So, what is a job standard, this man does it at this ways, but when I do it, I do it within 8 minutes ok.

So, then if an old men does or if a unskilled labour does, he might take more time, but when a skill labour does he does it in a short span of time. So, now what you have to do, you have to now establishes a standard. So, that is nothing, but the standard time as job standard. So, that is normal time plus allowance, which is all put together, and that is how you try to find out what is the estimated direct cycle time.

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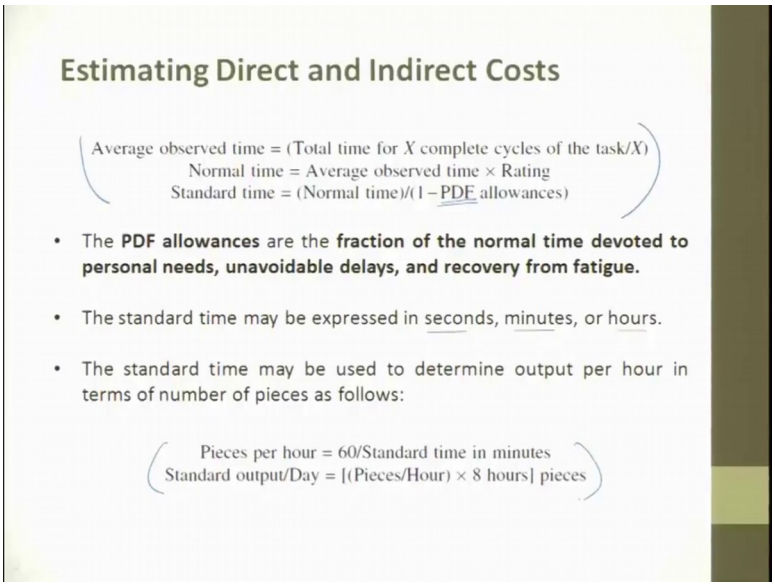

The next topic of discussion is going to be estimating direct and indirect cost. So, here as we have already seen

(Average absorbed time) = (total time of X complete cycles of the task / X).

(Normal time = average observe time * rating).

(Standard time = normal time / 1 - P D F allowance).

So, all these things are very important. Please remember these formulas, there can be questions in the examination point of view. So, what is P D F allowance? The P D F allowance are the fraction of the normal time, devoted to the personal needs unwanted, unavoidable delays and recovery from fatigue. So, these are all given us part of P D F. The standard time may be expressed in seconds, minutes or hours, depending upon the job. The standard time may also be used to determine the output per hour in terms of number of pieces as follows,

(Pieces per hour = 60 / standard time in minutes);

(Output per day = pieces per hour * 8 * pieces). So, this is a trivial one. So, for calculating the number of pieces what is to be produced?

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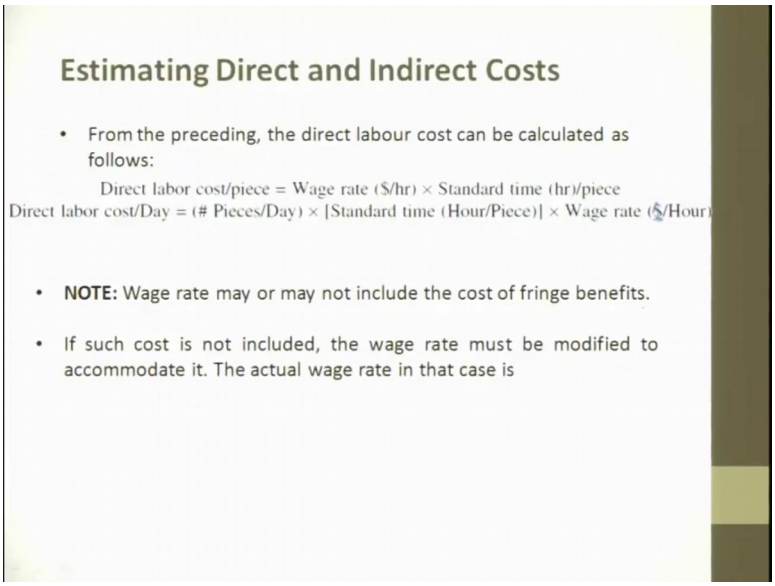

From the preceding the direct labour cost can be calculated as follows,

(Direct labour cost / piece = wages rate($/hr) * standard time (hour / pieces)).

So, the direct labour cost per day, when you try to do a per piece. Now when you try to talk for day is nothing, but pieces per day in to standard time, hours for piece in the average, this average rating which is in rupees per hour.

So, note the wage rate may or may not include the cost of fringe benefits, where are small fringe benefits which we try to give in industry; that is and not there. If the cost is not included, the wage rate must be modified to accommodated.

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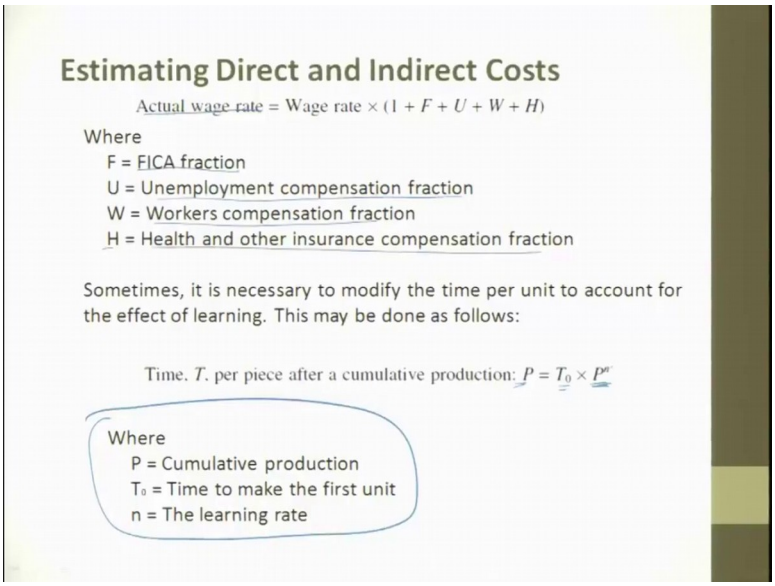

The actual wage rate in that cases,

(Actual wage rate = wage rate * (1 + F + U + W + H)).

F is nothing, but FICA fraction, U is unemployment compensation fraction, W is work compensation fraction health, H is health and other insurance compensation fraction.

So, all these things put together we try to get 1 plus F, U, W and H, we try to multiply with wage rate and what we get is the actual wage rate. So, the next thing is, sometimes it is necessary to modify the time per unit to account for the effective of learning. So, this may be read an

Time T for piece after cumulative production P,

(Cumulative production $P = T_o * P^n$)

production, added production, T not is the time to take the first unit, P is the learning rate.

So, initially is the learning rate will be very high as slow learning rate will be slow, and then what happens is, after certain saturation of time the learning rate is not going to be so much. So, it reaches the saturation point. So, here what you have done as, we have tried to put that into the formula, so that you can try to get. So, if you assume that at initial time n will be slow at later time the n will be, after some point the, initial it will be

point 1 point 2 point, so that understanding the process when she has learnt it, then this does not come into existence.

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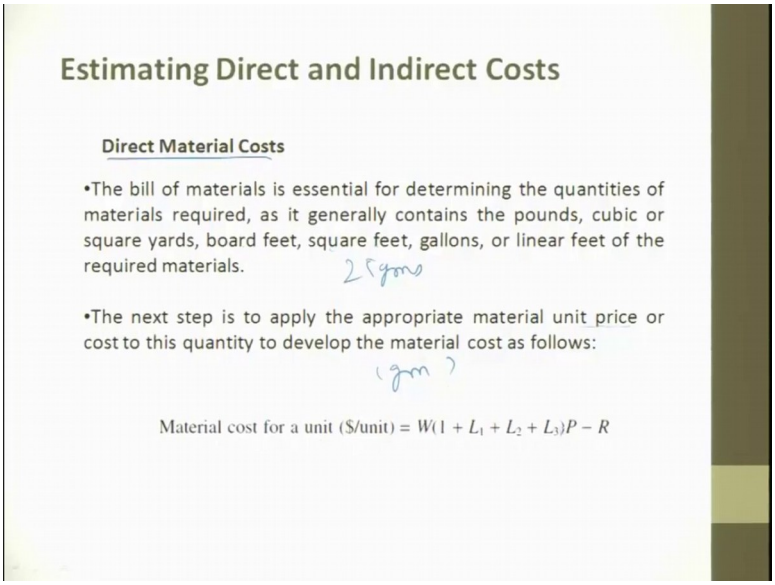

So, the direct material cost, the bill of material is essential for determining the quantities of material required, as it generally contains the pound cubes or square yards board sheet, board feet, board feet, square feet, gallons, linear feet etc. etc. So, we try to calculate what is the material which is used and how much material which is used. Basically, if it is given in weight, we try to come in density and then we try to find out the volume. So, we tried to criss cross and play many things. The next step is to apply the appropriate material per unit and the cost in. So, we have found out that 25 grams of to be used.

So, now, what I am trying to say 1 gram is what. So, with that what we do, if we try to multiply and then we try to get the material cost. So,

Material cost for a unit = W * (1 + L_1 + L_2 + L_3) P-R

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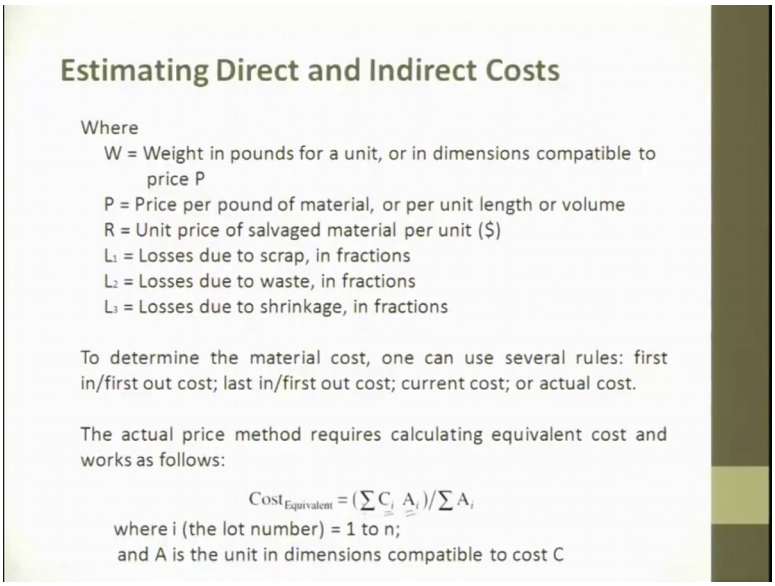

So, what is W, W is weight in pounds for a unit, P is the price per pound, R is the unit price of salvaged material per unit, L 1 is the last due to scrap, L 2 is the last due to waste and L 3 is the last due to shrinkage. It's all in fractions, all the three can be there, any two can be there, only one can be there that is left to recall the product on the process what about us. To determine the material cost one have, one can use several rules. First in first out cost, last in first out cost, current cost or the actual cost. You can you any of these thing and then we can try the costing.

The actual price required requires calculating equal and cost and work as the follows

$$Cost_{Equivalent} = (\sum C_i * A_i / \sum A_i)$$

What is A? A is a unit in dimensions compatible to the cost C and i is varying the lot number, it can be 10, what is a back size that called as a lot number.

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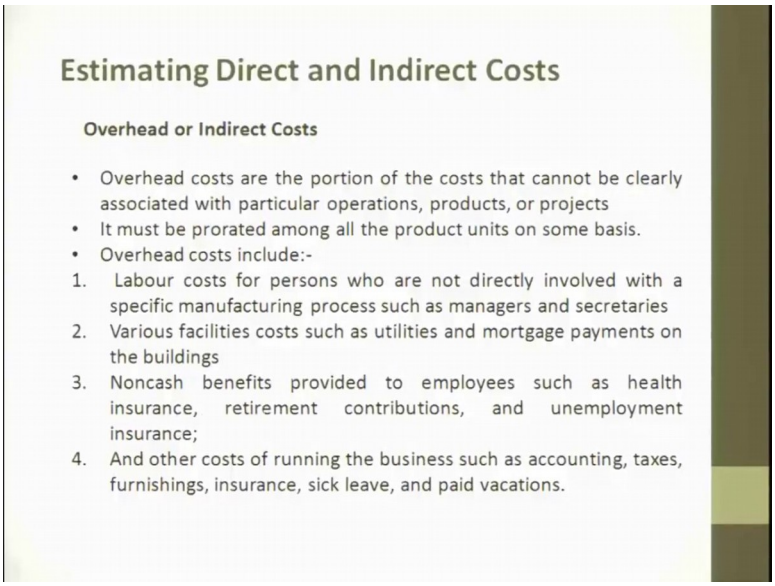

So, we have seen direct cost we have. Now we will see what are the indirect cost. The overhead cost or the indirect cost or the portion of the cost that cannot be clearly associated with particular operation product or project. It may be prorated above all the product units on the same basis. Overhead cost includes labour cost for persons, who are not directly in involved with specific manufacturing process such as manager, secretary, various facility cost such as utilities and the mortgage payment.

Non cash benefits provides to employs such as health insurance, retirement contribution, unemployment, insurance and any other cost of running the business such as accounting, taxing, furnishing, insurance, sick leaves, paid vacation etc etc. All these things fall under indirect cost.

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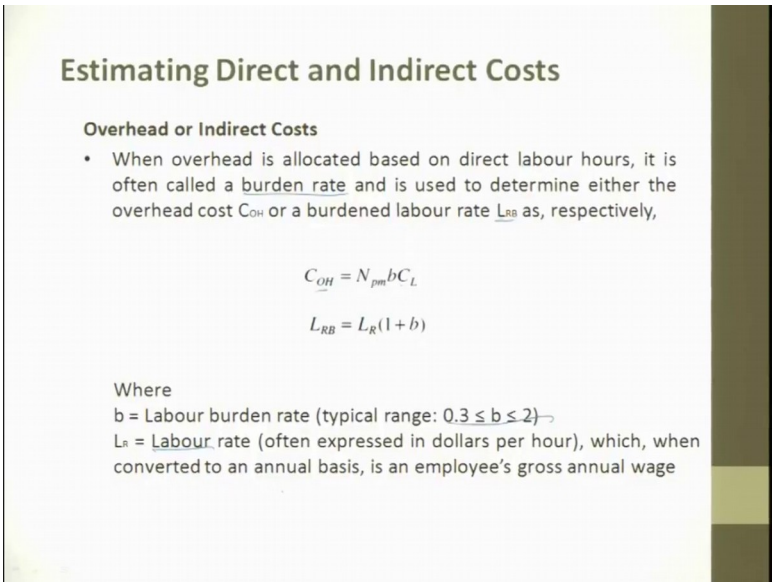

When overhead is allocated based on the direct labour cost, it is often called as burden rate, and is used to determine either the overhead cost C_{oh}, or the burden labour rate L_{RB} as

($C_{OH} = N_{pm} * b * C_l$)

L_{RB} is that that is nothing, but the burden rate.

$_{OH}$ is the overhead cost; overhead cost N is the number. B is nothing, but the burden labour burden rate which always takes a valuable point 3 to 2

($L_{RB} = L_R (1+b)$). Often expressed in dollars per hour, which when convert to an annual basis is employment gross average basis.

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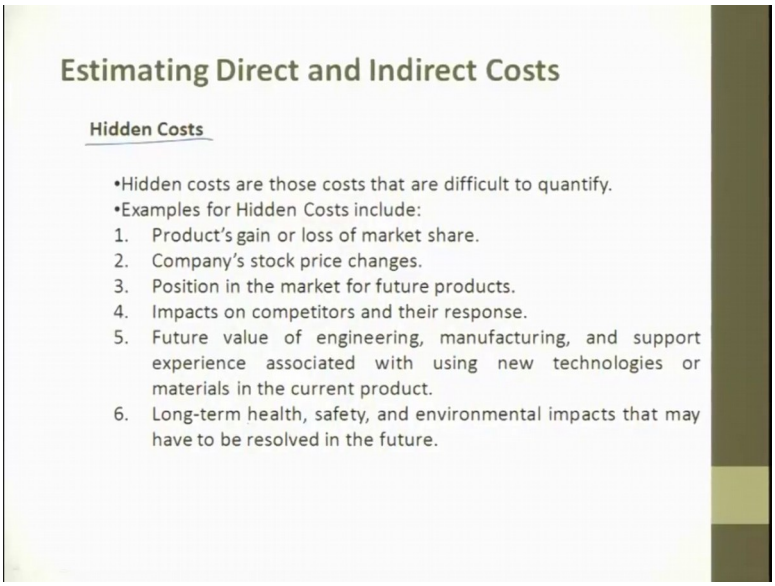

What are the other hidden costs? Hidden costs are those costs that are difficult to quantify. Example for hidden costs products gain or loss the market share, company's stock price changes portion in the market for futuristic product (Refer Time: 29:26), positioning the product to the futuristic market, impact of competitors. Future value of engineering manufacturing and support experience associated with using new technologies and material. Long term health safety, environmental impact, are some of the hidden cost which are involved in costing.

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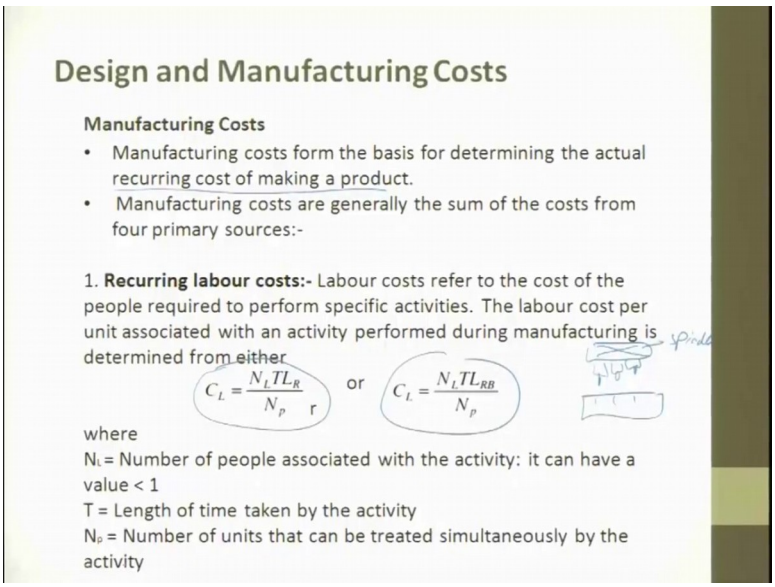

So, design and manufacturing cost. Till now what you will saw. We saw overhead cost, we saw direct labour cost, then indirect labour cost, then we saw hidden cost. The next time we will say manufacturing cost. So, manufacturing cost forms the basis for determining, the actual recurring cost of making a product. Manufacturing cost are generally the sum of cost from four primary sources. The first one is recurring labour cost, the labour cost refers to the cost of people required to perform specific activities, the labour cost per unit associated with an activity performed during manufacturing can be determined by this formula.

So, these two formulas are the same. So, where $_{N}L$ is the number of people associated with the activity, it can be values always less than 1, then T is nothing, but the length of the time taken by the activity, and P is a number of units that can be treated simultaneously by the activity. For example, if you have something like gang drilling. So, you have one work piece, you have several drills which are attached to a spindle, which is attached to a spindle and you can do all three holes these are drills. So, you can do all the three holes machining at simultaneously, that is what we called as number of units that can be treated simultaneously by the activity, or generally you take about heat treatment, all 1000 parts to be done in one heat treatment that is what you are talking about $_{N}P$.

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So, design and development cost. So, here what we saw was manufacturing cost. The next one is design and development cost. Design and development costs are referred to as non-recurring cost. So, here manufacturing cost is recurring cost, every part I produced there is a manufacturing cost. Designers one time, I make it and that is frozen for rest of the time the product is made in the factory. So, as they are one time charges and no matter how many units you produced are manufactured.

The specific elements of design and development cost that that must be included are development of product specification, conceptual design after listening to voice of customers, intellectual property acquisition or of a protection against licensing, design of a product including the creation of engineering drawing, software development, creating prototypes, functional testing and environmental and product qualification and certification. So, all these things are nothing, but costing which are involved in design and development, this is one time of air. When you talk about manufacturing cost, it is every part you produce, there is a recurring cost.

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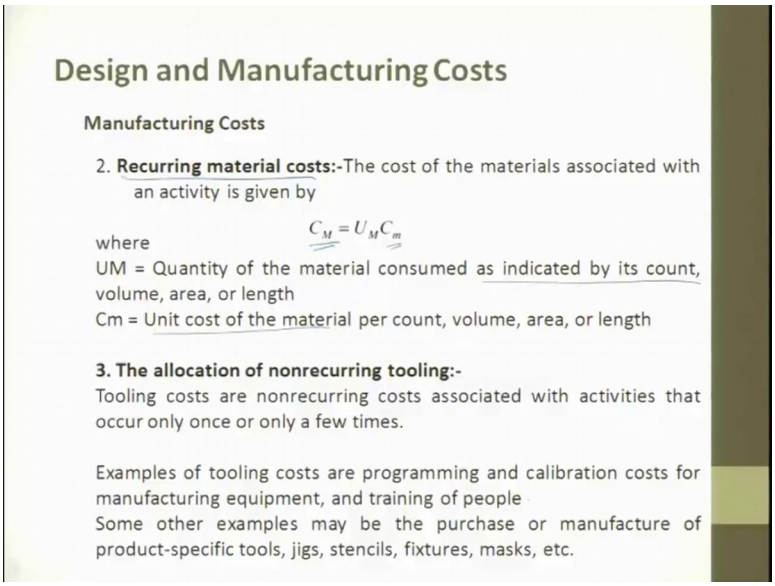

So, the recurring material cost can be further found out. The cost of a material associated with an activity can be given by

($C_M = U_M * C_M$)

and what is U_M? U_M is the quantity of material consumed as indicated by its count, volume, area or length. C_M is the unit cost of the material per count is nothing, but the C_M. So, we tried to calculate the recurring material cost in terms of C_M then allocation of non recurring tools. Tools cost are non recurring cost associated with the activities that occur only once or few times. So, for example, once and 100 cycles I have to replace the drill.

So, for every 100 parts you do it once and many a times you buy a spanner and that is spanner is all that pass spanner stage with your rest of the life whenever you do some operation of it. So, those things are called as one time offer, or a few times in this cycle. So, examples of tooling cost are pro programming and calibration cost for manufacturing equipments and training people some other examples maybe a purchase or manufacture of a product specific tools, zigs, stencils at etc etc.

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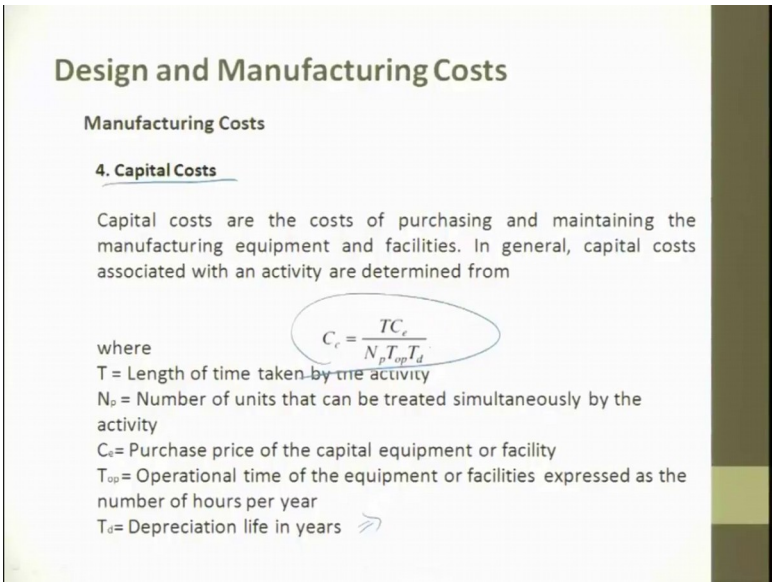

What is the capital cost? Capital cost is a onetime investment cost; it can be construction of a building, buying a huge capital intensive machine. So, capital cost of those cost for purchasing and maintaining the manufacturing equipment and facility. In general capital cost can be associated with this, T is the length of the time, where limits the activity is going to take, C e is the purchase price of a capital equipment of facility that is C_e, N_p is a number of units which is produced, T_{op} is operational time of the equipment, and T_d is the depreciation life in here.

So, many a times several of these buildings what are existing today, they have a value of almost zero. The depreciation has gone so low that they have the task reached, the value of the building as per the records are zero. So, this is where there is a depreciation life, which places a very important role in costing. Many items if you start putting depreciation over a period of time become the value becomes zero, but this product or the part or the part of the building what you hold, has a value even after the depreciation life period is over. So, here costing place a very important role ok.

So, this is how you tried to calculate the capital cost, and equipments. Please understand many a times when we do disaster management camps, what we do is, we try to establish one time and that is only for a small period of time maybe 15 days, 1 month, 1 day whatever it is something like. So, those are called disaster or occasional or an even best this thing. Here what we calculated a long term project, a car manufacturing site, the investment involves or a college construction. So, that is what we try to talk about, and here I am always talking to about the product when you talk about an institution, it is number of students it can accommodate ok. So, we have to tweak the definitions little bit. What is a process flow model?

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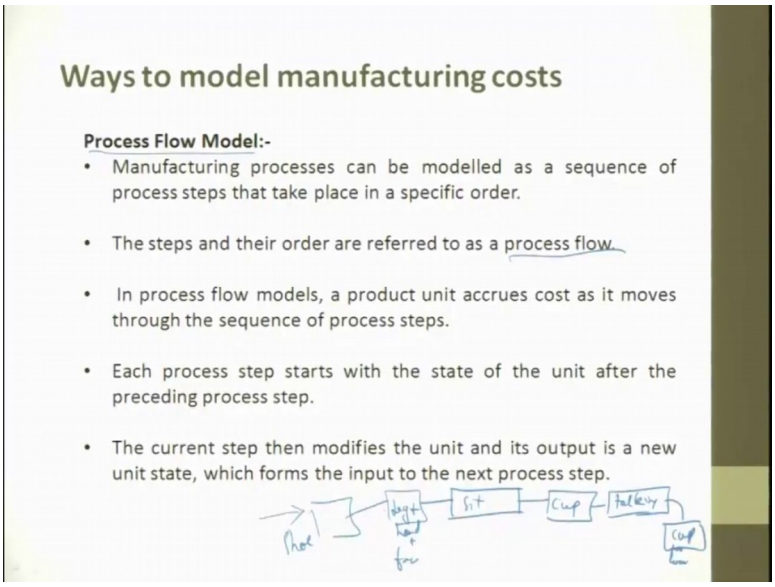

So, process flow model is manufacturing process can be model as a sequence of process steps that takes place in a specific order. For example, as soon as you get into your house, you remove your shoes, and then you try to wash your legs and hands and face.

Then you go sit in your living room or in your dining room and start having a cup of tea. So, then you sit in your living room, then you have a cup of tea, then you have a small talking session with your family or with your friends, and then what you do is, you finished the cup and put it cup for wash.

So, here what is happening, these are a sequence of events which happened as soon as you enter your house. So, manufacturing process also has a similar sequence. So, this sequence can be in such a way that you do not even remove shoe you directly go sit have a cup of tea, or you just do not even have a cup of tea which choose you just go tour start talking to your friend sitting in the living room, possible ok. The process is established, if the sequence is established, you can follow the same sequence all the time, you can even jump over the sequence and execute. The process in manufacturing also it is the same. Manufacturing process can be model as a sequence of process steps that takes place in a specific order. The steps and the order are referred to as a process flow. In a process flow model, a product unit acquires cost, as it moves through a sequence of process steps.

So, every step it does, there is a value addition for a raw material to get convert there is a value addition, and for every value addition there is a costing. So, I costing its built up to the product, each process steps start with the state of the unit after proceeding process steps. So; that means, to say here I have assumed every product undergoes every step. The current step then modifies the unit and its output is a new unit state, which forms the unit of the next step. For example, every state if you are not interested in this example, you can try to remove it. I will try to give another example. Other example is, let us take a pizza.

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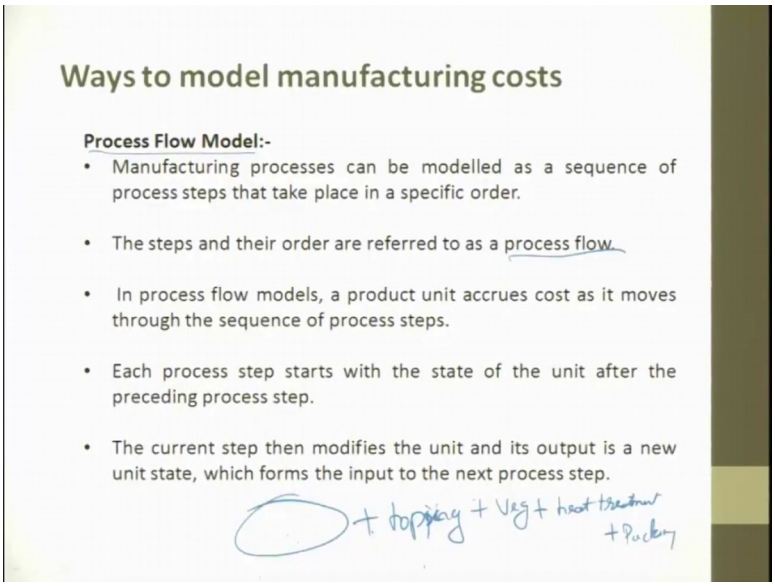

So, pizza base is there. So, then you add a topping to it ok, topping and then you add topping can be base and then you can have vegetables on top of, top in and then it undergoes a heat treatment cycle and then it undergoes a packaging cycle, before giving it to the customer.

So, every step there is a value getting added to the product and based on this value addition, the next stage in the costing also goes increasing. So, this is what we are trying to say in this process.

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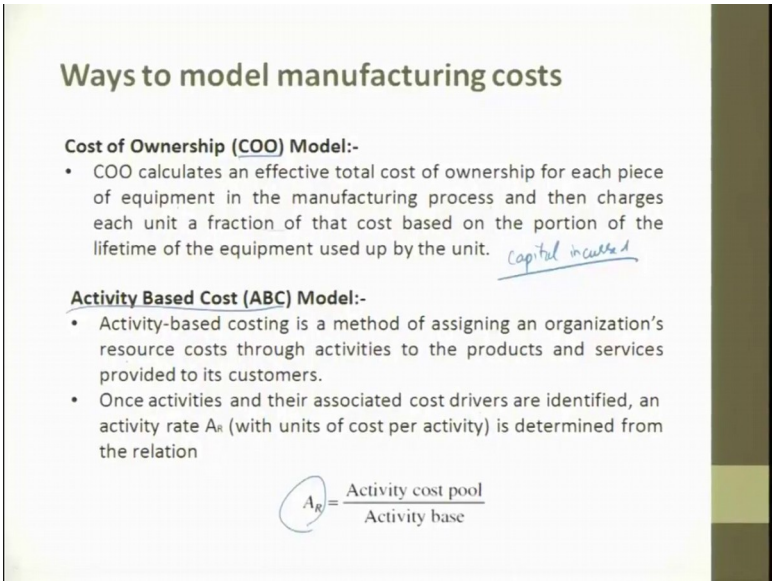

So, the cost of ownership model, this is one COO is one model, the COO calculates an effective tool, cost for ownership for each piece of the equipment in the manufacturing process and then charges each unit of fraction of that cost based on the portion of the lifetime of the equipment used by the product for example, I buy a tawa and this tawa is used for making 10000 [FL].

So, what I do? This tawas cost is 10 rupees or 100 rupees, I divide this 100 by 1000. So, when I try to sell this [FL] I try to add. So, much of component into that [FL] as a cost for the oldest model and then I try to sell it. For example, this is the capital cost, capital cost I have incurred, I have incurred. So, I divided by the number of products and then get it, the another one is called as Activity Based cost, activity based cost model ABC model, the activity K base cost model is a model is a method of assigning an organizational resource cost, through activities to the products and services provided to the customers.

So, here it is only the products, which is produced here. It is also and the service is also done once activity and their associated cost driver are identified and activity rate A R is given in determining the relationship. So, A_R is nothing, but activity cost pool divided by activity based. So, here Activity Based Costing is a method of assigning and organizational resource cost through activities to the product and the service provides. So, that is ABC Activity Based Costing is a method of assigning and organizations resource cost ok, through activities to the product and service once the activity and associated costs drives are identified and activity rate is determent for the relationship.

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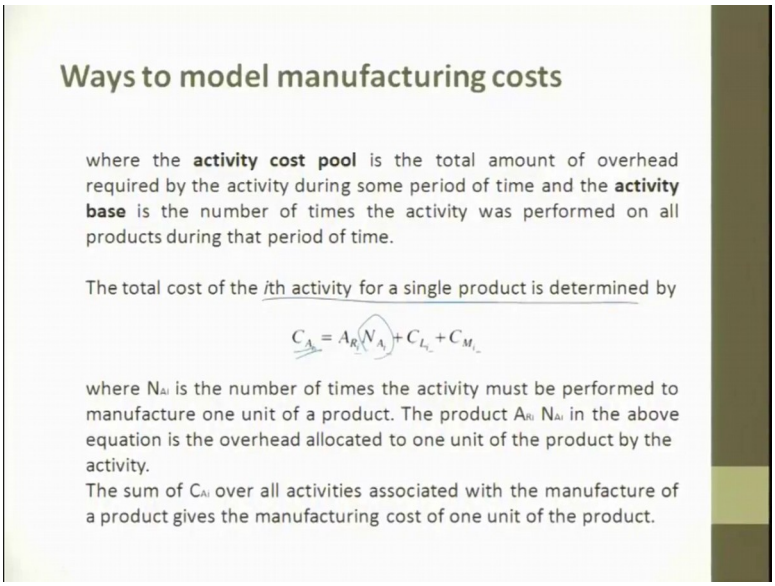

Where the activities cost pool? What is the activities cost pool? Activity cost pool is this. So, I can say it is ACP. So, the activity cost pool is the total number of overheads required by activities during some period of time and the activities based in the number of times. The activity was performed on the product during the period of time. So, the total cost of the i-th activity of a single product is determined by

$CA_i = (A_{Ri} * N_{Ai}) + C_{Li} + C_{Mj)}$.

So, this is the i-th the product ok.

So, a N_{Ai} is the number of times, the activity must be performed to manufacture one unit of a product, the product A_{Ri} and N_{Ai} in the above equation is the overhead allocated to one unit of the product by the activity for one unit. C_{Ai} is overall activity associated with the manufacturing sorry, in today's lecture it is all more of costing and it is a simple say, a formula, these formulas are very simple, but you have to remember this from the examination point of view, it is just applying logics and then they start doing.

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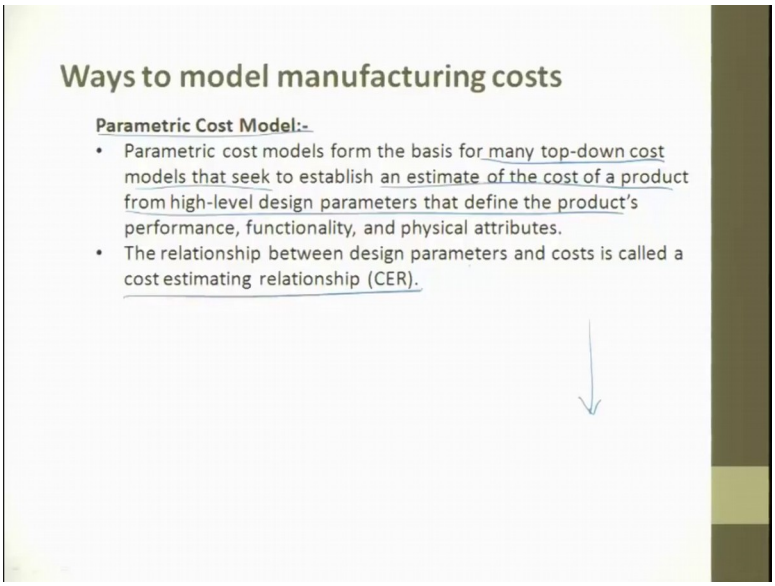

The last one is called as a parametric cost modelling. So, we have see two models cost of ownership model, activity based cost model, then we have parametric cost model. So, the parametric cost model forms the basis of many top down cost models that seek to estimate establish, an estimate of the cost of a product from higher level design parameters that defines the products performance functionality and physical attribute.

So, this is called as parametric cost model here forms the basis of, for many top down costs, many top down cost models that seeks to establish an estimate of the cost of a product from high level design parameters, that defines the product performance functionality and physical attributes. The relationship between the design parameters and the costing is called as CER, which is nothing, but cost estimating relationship.

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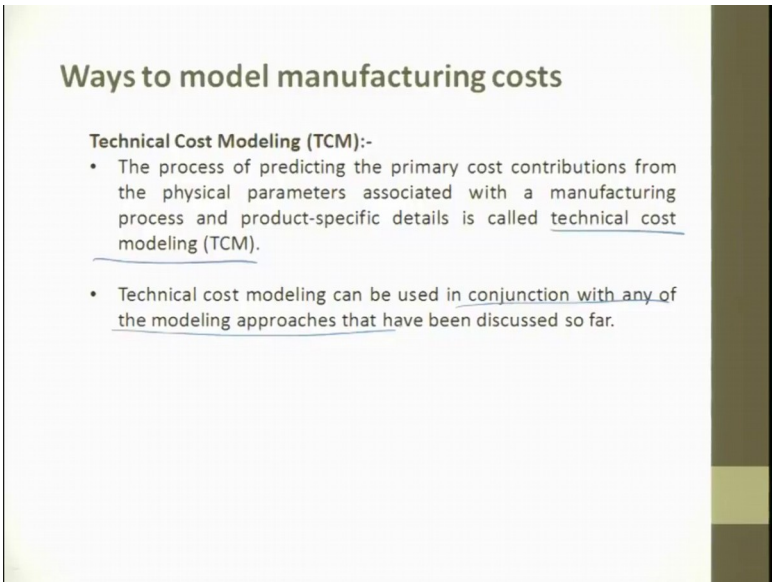

So, the technical cost modelling the process of determining the primary cost contribution from the physical parameters associated with the manufacturing process and the product specification, specifying details as called as technical cost model. So, this can be used in conjunction, with any of the model approach that can be associated. So, for discuss, so this can be associated. So, what all did, we see, we saw cost of owner activity, based cost, when we saw parametric cost model and then finally, we saw technical casting model.

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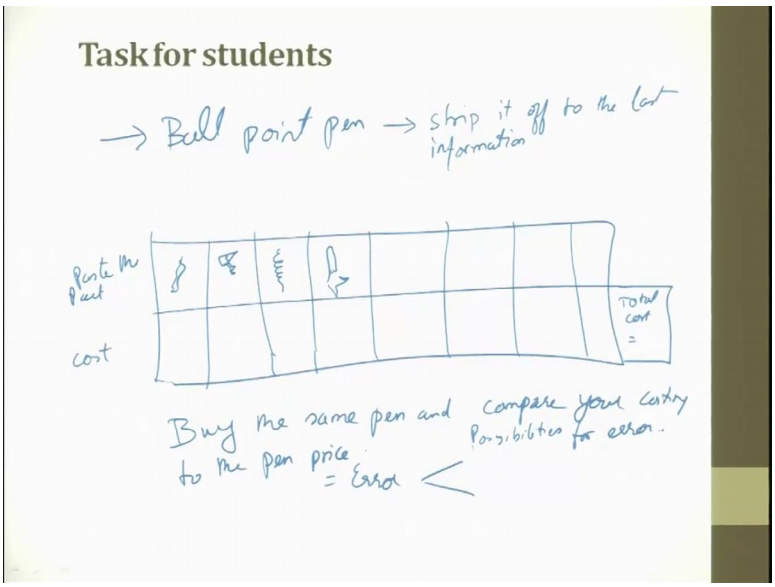

So, task for students take, ballpoint pen and then try to dissect; that means, to say strip it off to the last information. For example, you remove all the parts, keep it in front of you then put a small for example, So, here you put the cost, here you paste the part, something like this. So, here what you will do is, you will start putting approximate cost, what is known to you here and then what you will do is, you will try to put a total price. So, here what will happen is you will have a total cost looking into all the parts, you will try to summarize and then put then go to the market try to buy the same pen and compare your costing, what you are done piecewise to the pens price and now, you will understand how difficult or how much is costing important or what is a variation you give and in this, you have put only the manufacturing cost right.

So, here in this behind, this manufacturing cost, there are process cost, design cost, all those things. So, then you will try to understand there will be an error. So, now, you will have to divide what are all the possibilities for error, when you do this exercise, you will have a thorough understanding of the difficulties, which is involved in costing.

Thank you very much.