Entrepreneurship Essentials
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Module - 08
Lecture - 39
Cost, Volume, Profit: Break-Even Point Analysis – I

Hello in the previous sessions we have seen how financial statements are prepared and then how profitability is estimated profit-loss and then cash flow statements. In this session we are going to see how to decide whether a business is attractive or unattractive in terms of break-even point or at what level of operation a company is going to achieve a no profit, no loss zone meaning that beyond which the company is going to make profit.

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So we will try to see that among different business propositions which one is more attractive based on level of operation meaning which business is going to become profitable at a low-scale of operation and which is going to be at may which is going to give us profit at a high level of operation.

Now it is not always necessary that a break-even point is high then the business is not attractive, if it is low, it is not it is more attractive, there is no formula like that because some businesses actually gives very high profit as we achieve break-even point.

Now after break-even point some business may not offer opportunity to increase the market or increase the sales because market may be limited. So there are many questions which are to be looked into in a holistic manner before making a decision as to which business is attractive or more attractive. These are the items to be covered, we will see how cost-volume and profit is related then break even point analysis advantages and limitations of break even point margin of safety etcetera.

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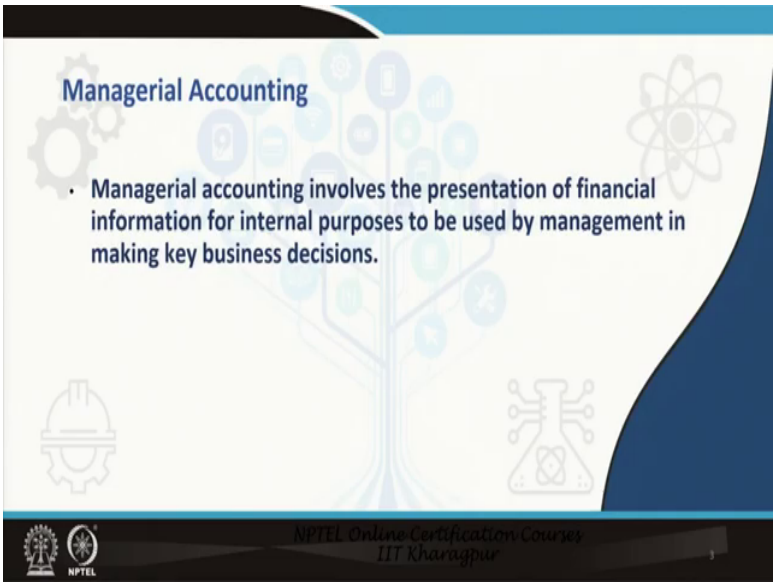

Now before we dive into the main topic, that is break even point, let me just tell you while discussing about financial statements I mentioned that there are different sets of financial statements. One set is given to income tax authorities and government of India where you show less profit because you take advantage of depreciation.

Whereas, another set of financial statements are given to other stakeholders like banks like ROC Registrar of Companies and then stock markets where depreciation is shown in rather more rational way that inflates the profit and it is advantageous for the company because they tell their stakeholders that we have made more profit compared to others.

A third set of financial accounting accounts are made for internal consumption for the management to take decisions particularly they compare different units performance of different units and then depending on macro micro-economic environment they decide

pricing strategies, they decide which market to focus on or which product should be discarded and which one should be promoted more. So depending on the cost benefit analysis they try to do all of that.

So they prepare another set of documents which is distributed among the internal stakeholders and then they consume that for internal decision making which are called managerial accounting.

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So managerial accounting primarily talks about budgeting, trend-analysis, forecasting, accounts receivable management if you can recover money faster, then opportunity cost is less because you get the money, but at the same time perhaps if you give longer period of credit, you achieve more sales. So you have to do a balancing between the 2 that is a trade-off between higher period of receivables and then quicker recovery.

Then there are other constraint analysis for operation of a business, there will be various constraint and you can make compromise at different points. So these are part of the financial managerial accounting inventory turnover analysis, financial leverage matrics where you decide what should be the return on cost of capital, depending on that you make jugglery between borrowing own capital then you buy machine on lease rather than buying it paying cash then there are price product costing and valuation.

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Then there is another subject called managerial economics which is not really accounting but then this is also very closely related to financials of the company, performance of the company, viability of the company. It helps managers to make decisions by responding to changing economic situation both macro, micro.

So this also is very helpful for managers to forecast where we are actually moving to depending on that they may tweak their decisions and then they may chart a different strategy different path. It provides a process of applying economic theories and methods for financial decision makings.

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Now managerial economics has seven distinctly different sections. One is demand and supply analysis and forecasting cost and production analysis, inventory management, advertising, pricing, decision, policies, profit management, capital management. So you can see that there are overlaps between financial sorry managerial accounting and managerial economics. There almost 2 part of a same book something like that. But then books at different subjects are taught different separately etcetera. But then there are these subjects I just wanted to wanted you to know that.

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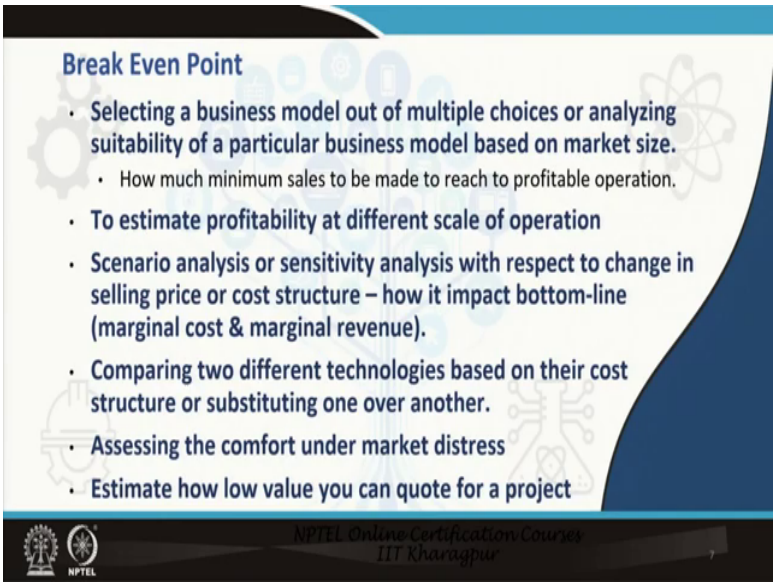

So our main topic today is break-even point. Break-even point primarily is a point of turnover or sales in terms of number of units that you sell when you just somehow managed to recover all your expenses. Your fixed expenses and variable expenses will define fixed and variable expenses. But you recover all your expenses and you run at low profit no-profit no-loss zone when at when you achieve certain turnover, certain sales volume.

And the utility of that is enormous because first of all you want to dis you want to get an idea that our this year's turnover is this and given the market condition, we are going to grow something like say 30 percent. So at what point of time we are going to be we are going to break-even meaning that we are we will stop making loss incurring loss. And then we will know if we sell incremental number of product, how our profitability is going to change or manifest?

So depending on your analysis of the break-even point. So break-even point is very important in that sense. Suppose you just want you have a number of projects where you participate. Now you want to participate in another tender. So given your cost structure, your fixed cost structure and the variable cost structure of the new project, you can make a decision whether to really quote for this project or at what minimum value that we can quote so as to not make a loss. So this is not otherwise possible without doing the break-even analysis.

So you try to understand your comfort zone as well. In the sense that suppose you are operating at certain sales volume and you are making profit. Now if you know that break-even point is slightly below that will give you a scare that if our sales goes down, to the to by a small extent we are going to be in the loss territory.

So if that difference is more then you feel comfortable that even if the market condition goes down goes bad still ourselves may we can afford to go down our afford for our sales to go down and we will still not enter into a loss territory. So all of this are done using a break-even analysis.

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So for break-even analysis the primary objective prof is profit and for any business that you operate sustainability, existence existed whether its a even non-profit organization they want to see what kind of surplus they are making because if they do not make surplus, they do not exist. They cannot continuously depend on grant or borrowing, they normally that they do not borrow, but they depend on grant.

But if they make some surplus, they can keep on enlarging their domain they can grow and then they can reach out to more and more needy people and do more good to the society. Forget about that just for profit enterprises, their primary objective is to increase profit that is the money that goes to the owners of the business. So owners will always be interested in profit. Of course, at sometime on a short-term perspective they may not focus their attention mostly on profit because they may be interested in increasing their market share.

As the market share goes up they will have better pricing power, better grip on the market they will create some kind of brand by offering product at a lower price. So in the process they may not make profit they may actually incur loss, but then as soon as they create a loyal brand, then they can think of increasing the price and make more profit. So that is when they will start making profits. So there may be strategies of different kind, but profit is the sole objective of a for profit company.

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But then if you are sitting and thinking suppose, you are owner of a company and thinking that let me think of increasing the profit my profit is not so good. So you have several options particularly, 2 options number one is profit is a percentage of sales. So if you want to increase the profit, increase the sales simple formula, but increasing sale is not such a easy things to do.

Second object second option is to increase the selling price of the product. So, your margin goes up per product, but then you run the risk of losing customers because its a competitive market, if you are in a monopolistic market that would be different, but if you are in a perfect competition market, if you increase the price by say 1 percent, 2 percent, customer will go to another product rather than your brand. So you lose market rather than increasing the sale sales or increasing profit your profit may actually go down.

Then for if you adopt the first strategy that is to increase the sales, how can we increase sales? You have to acquire customer at a cost, you have to advertise. So in the process your cost of manufacture is going to go up even your overhead cost may go up like selling expenses, like you may have to put up another shade somewhere for warehouse or something so your fixed cost may go up.

So eventually, you do not know whether by increasing the sales, using all the possible options or wherewithal that are available whether you are really going to increase the margin or it is actually leading to higher cost structure and then eventually you incur loss

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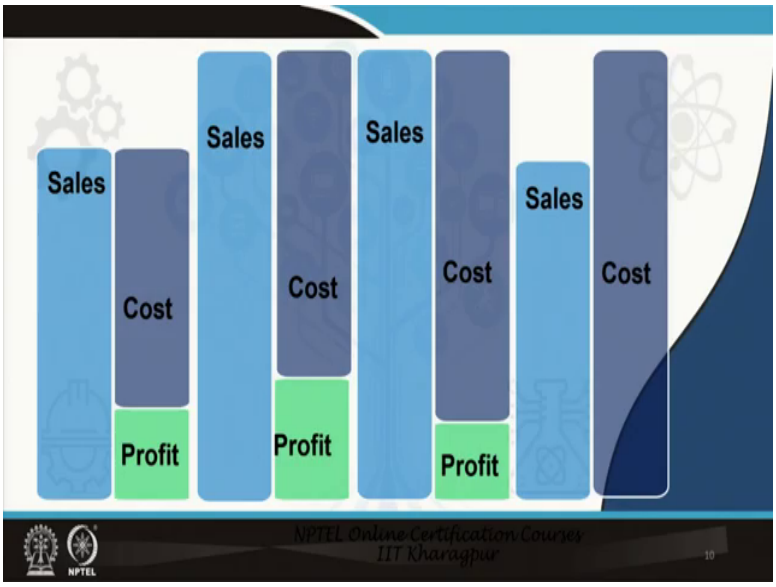

So its a complex situation and in this complex situation, you have to live with break-even point analysis because that gives you some kind of idea whether increasing the sales, using all the options available is a good idea or not. So it is showing slightly graphically not so wonderful, but then a starting with say, you have a sales you have a profit now you want to increase the profit sales goes up, profit goes up, but then at times sales may go up, but then cost also may go up and profit may actually shrink.

It might so happen in a scary situation like you increase the price of the product and sales goes down and your cost goes up so much that you actually incur loss.

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Cost is normally divided into 2 part fixed cost and variable cost. I have another slide where I will be elaborating on that. So profit is nothing, but sales minus total cost fixed and variable, total cost. So sales is unit price multiplied by number of product that you sell.

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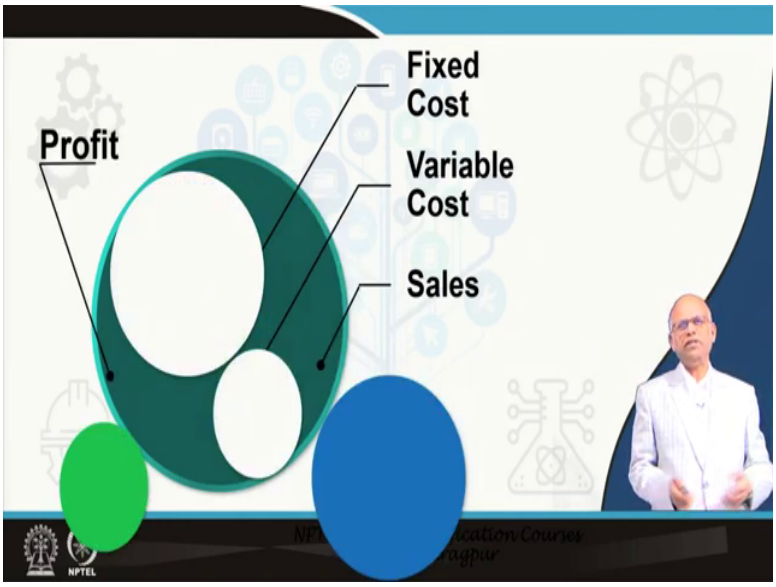

And variable will come to that this is also not so important we will be elaborating on that. This is just to show profit, sales minus fixed cost minus variable cost whatever remains is profit. This is also not so important to just bypass perhaps.

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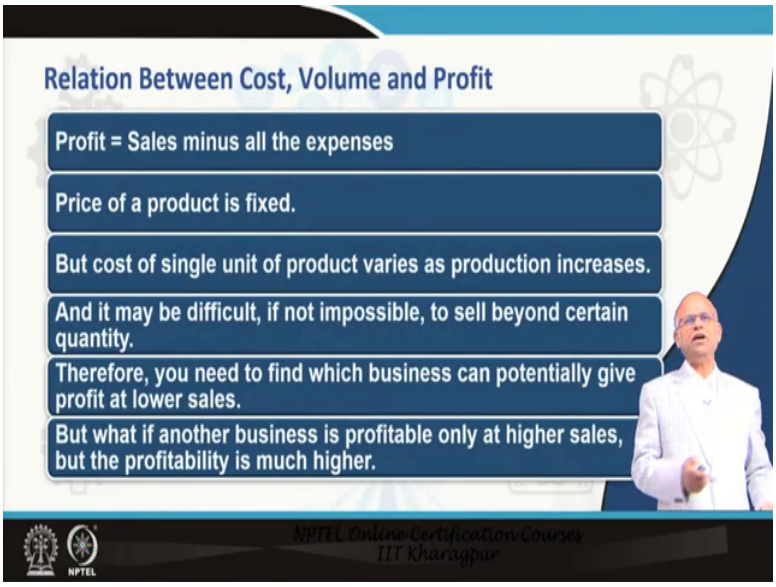

We have already mentioned all of that, you need to find which business can potentially give profit at a lower sales, if you can do break-even analysis of 2 businesses. But then for some business, even if the break-even point is higher, beyond the break-even point you may actually earn more profit depending on your fixed cost and variable cost ratio or their relative quantitative relation. Then again, there are other issues like suppose for some business the break-even point is at a very low level.

Now the market may not be large enough to go beyond break-even point a large distance. So if you cannot cross break-even point by a large margin, there is no point it will not make profit not no significant profit.

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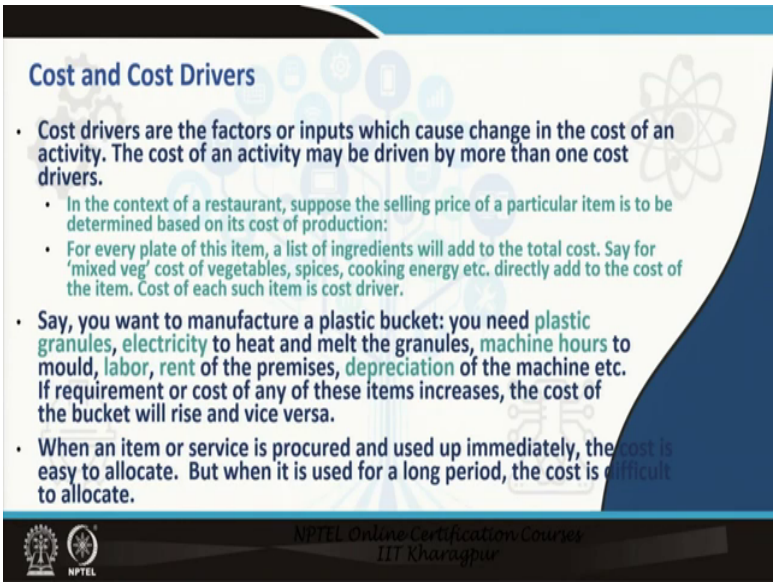

So all those points are there to be considered, that is why break even point in isolation may not give a lot of meaning, it should be considered holistically. Now to understand break even point, a fundamental thing is the cost driver. This should have been at the beginning only cost drivers are factors or inputs or items which cause change in the cost of an activity. You have some activity whether you are painting the body of a vehicle or say you are washing something say you are wash you have a wash washing unit for car or maybe you were manufacturing plastic bucket or whatever you are doing for any particular activity, many items are involved, there are many cost drivers.

Suppose you are running a restaurant. Now you are thinking of a particular dish and then you want to increase the selling price of the dish because you want to increase the profit. Now

before you think of increasing the price of the dish, you need to know what is the cost? What is the cost of structure?

Now what are the cost driver of the dish? Cost drivers are all the ingredients that go into manufacturing the dish. The it may be vegetables, it may be paneer, it may be cooking oil; oil means spice, is may be other spices then you need gas to cook that to for heating the container.

So all of that are cost driver because you make one dish or one serving, you incur some cost you make 2 servings you incur double the cost. So anything that increases unit cost by due to their change suppose you add some more oil. So, the cost of the dish is going to go up. You add more paneer or less paneer. So cost of the dish is either going to go up or going to go down. That is what is known as cost drivers. Say in another example, say you want to manufacture plastic bucket.

Now, for manufacture say its polypropylene or HDPE or any other plastic. Suppose it is polypropylene. So when you are manufacturing plastic bucket you need plastic granule, it comes in a small small granule. So you buy those granules and you heat them, put them into a plastic injection mould the mould presses it, get the bucket. So you need plastic granule.

So for manufacturing one bucket, plastic granule will be some x amount. Suppose the bucket size goes up, larger, then you need more amount of plastic granule. So that is how cost driver is defined. By using more or less of the particular input or factor or item if the cost of the end product or cost of the activity like manufacturing plastic bucket goes up, then you are actually dealing with a cost driver. So for plastic bucket you need plastic granules, you need heating, electricity. Then you pay rent for the room, you have labour cost. So all are cost driver. Let us move forward.

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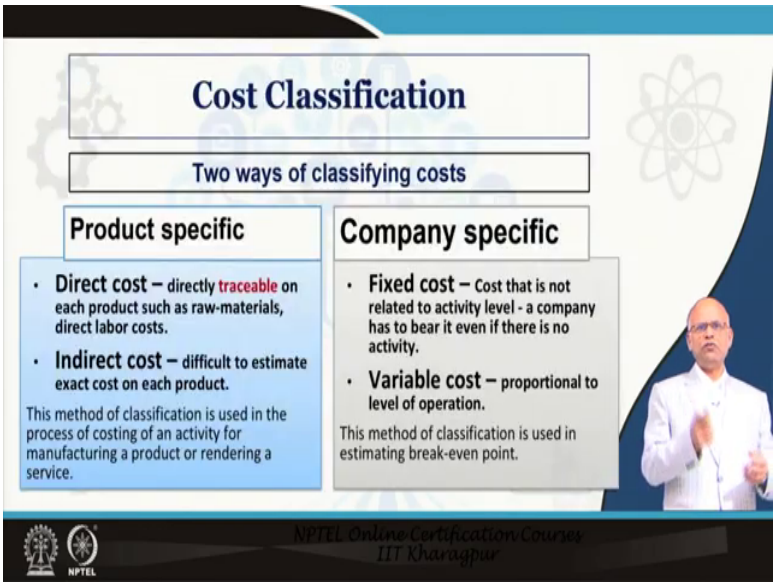

Now cost is classified in 2 ways. One is direct cost, indirect cost. We will be talking about direct and indirect when we will be talking about costing because it is more connected to costing rather than break-even point. For break-even point, we classify costs into 2 sects 2 different types, one is fixed cost another is variable cost. The fixed cost is the cost that is not related to activity level meaning, if your production goes up or down your fixed any cost that remains constant is the fixed cost.

Any cost that directly increases or decreases with level of production is variable cost. Direct cost means the cost that you can directly identify on the product. Say for example, a plastic bucket, you can identify the amount of plastic that has gone in if the handle is of is made of metal you can identify that metal on the bucket. So these 2 items are direct cost. What you

cannot identify is the rent, what you cannot identify is say the salary of the person that has gone in.

Indirect cost are those which cannot be identified like the rent, like depreciation, like salary of the person who has done it.

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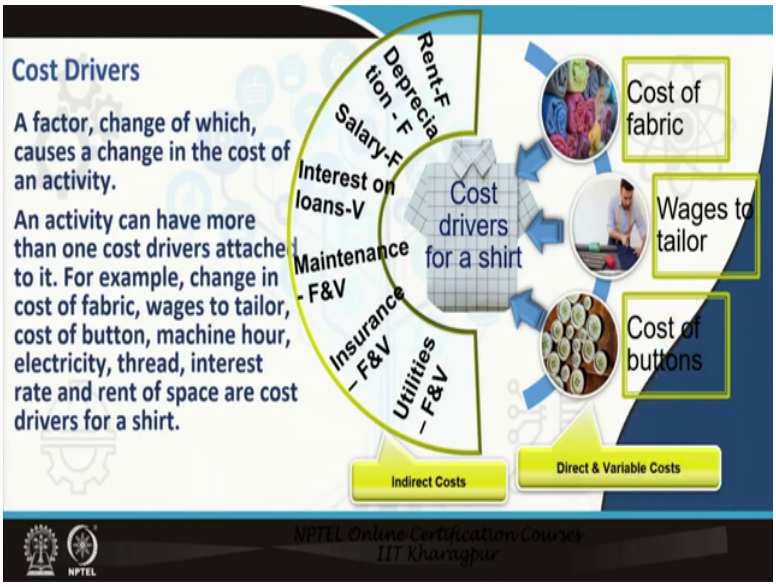

Let us move forward. Cost driver again, just to elaborate. Suppose you are manufacturing a shirt readymade garment. You want to sell that, you want to manufacture umpteen number of them and sell. So you what are the cost? Rent is a cost. Now rent cannot be identified on the shirt. So that is why it is indirect cost. Similarly, depreciation, salary, interest on loan, maintenance, insurance, utilities, these are not identifiable on the shirt they are indirect cost. But then some of them are fixed some of them are variable.

For example, depreciation is fixed because whether you manufacture 1 shirt or you manufacture 1 million shirt depreciation is going to remain the same. Then interest on say, short-term loan is a variable cost. Its a direct indirect cost, but then that is a variable cost. At the same time, on our right they are all variable cost like fabric is a variable cost, the salary to the [FL] or the person who tailor who is cutting and stitching is a variable cost. Because he or she is going to charge on an hourly basis or on a per unit basis.

If he makes 1 shirt is going to charge something like 100 rupees. If he is manufacturing 2 shirts he is going to charge 200 rupees. So this is directly proportional to level of operation or volume, number of buttons directly related. So these are variable cost.

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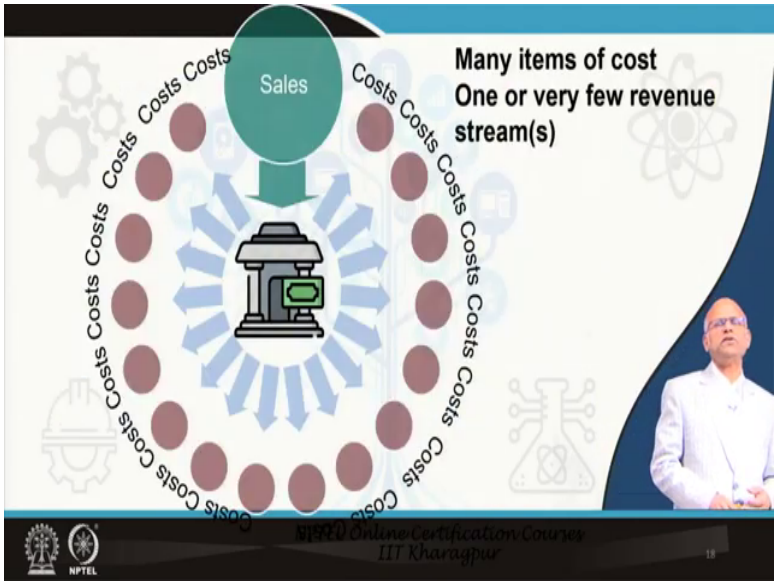

Another explanation of variable cost: this is not this is to be remembered all the time that we have umpteen number of cash outflow is stream. Stream of cash going out, stream of

expenses like say salary, depreciation, electricity, telephone, transportation, wages, then your internet expenses you go on and on and on.

There may be something like 100 of items where money is going out. All these money is to be collected or taken from sales that is the only a stream where money is coming in. Money is coming in through only very few items or streams whereas, money going out or through various various streams.

So we have to be careful about this estimation. How money is going out and how money is coming in and because there are so many in number, we have to classify them for better having a better handle on their management.

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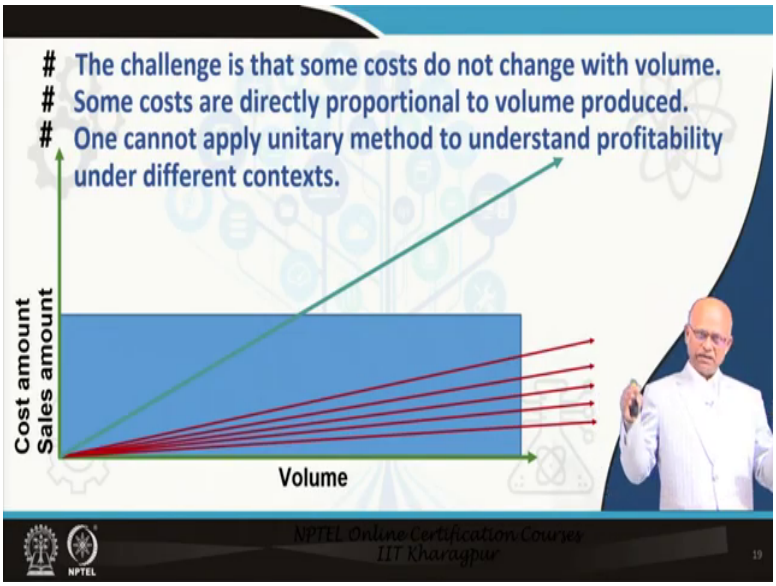

Particularly, look at this. The cost which does not vary with level of operation they remain constant. Say rent of a premises where you are doing business. To say the was supposed for this month, your production is low say at a 20 percent of your usual average production.

So you are going to use 20 percent of raw material compared to 100 percent. But your rent is going to be 100 percent you have to pay the full rent. So like rent, depreciation; you have to pay full means allow full. But then some costs are directly proportional to the level like material say cloth for shirt, button for shirt, they are directly proportional to the level. Even for them there are many many items. If everything would be proportional to volume, we can use unitary method to estimate if estimate at what level you are going to break event?

You know the total sales, you know price of a product multiplied by number of units sold is the total sales. You know suppose everything is variable cost, you know unit cost multiply that with the same number you know what is the total cost, what is the total sales. Then at some point of time you will reach a point where you will get break-even point. Unluckily there are fixed cost you cannot use unitary method and estimate where your sales and costs are intersecting and that is why you need to understand break-even point.

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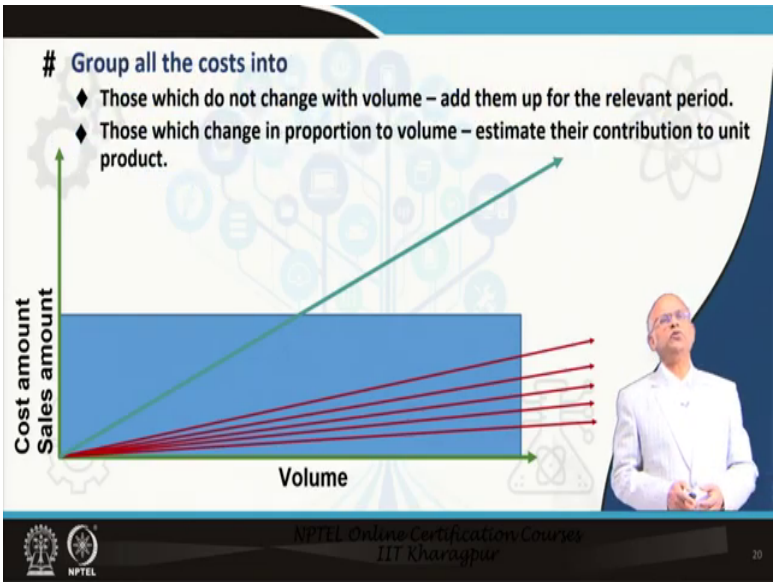

So what you do is you group all the cost that costs that do not change with volume of sales, volume of production. Sales and production are assumed to be same. This is a significant assumption for break-even analysis. We will come to that. So we have to identify those which do not vary with volume, we have to identify those which directly vary or proportionately vary with volume. Which do not change with volume, we add them up on an annual basis. Annually, whatever are the total fixed cost, we add them up we get annual fixed cost.

So that remains a horizontal line in a volume to cost scale, cost plot. And for variable cost that vary with volume, we do not know how many we are going to produce and sell that is why we estimate for unit product or unit. Unit product and then we multiply with a hypothetical number of products that we are going to sell because nobody has seen future. So

we assume some value, estimate the total variable cost. But initially, we estimate unit variable cost.

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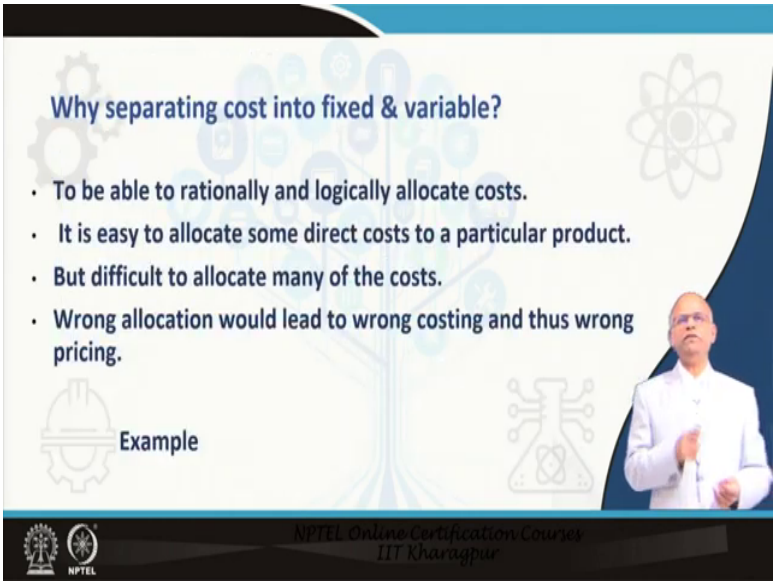

Why separating cost and a fixed and variable? This is the reason. Because if we do not separate them, we cannot actually use a unitary system, unitary mathematics, arithmetic to estimate that. Now to be able to rationally, logically, allocate cost. Like variable cost, fixed costs etcetera. But difficult to allocate many of the costs because you do not know suppose you are manufacturing shirts and also you are manufacturing suppose ladies garments were which are very complex.

Now say a ladies garments is sold for 5000 rupees whereas, a shirt, a simple shirt is sold for say subs 800 rupees this because they are sold at a different price their input cost also are different. Now how to allocate the rent? If you allocate rent on an average basis, that every

shirt, every dress will have average cost towards rent the per unit rent on the shirt will be too high and that will lead you to make a pricing that will not be attractive to the customers.

Whereas, you will price your ladies garment at a lower price because you are making average. So per unit ladies garment has a lower level of rent contribution of rent. So you are trying to sell a ladies garment you should be sell at 5000 rupees, but you are selling it at 4500 because the contribution of rent has gone down. So averaging has this problem, we have to be very careful about that part.

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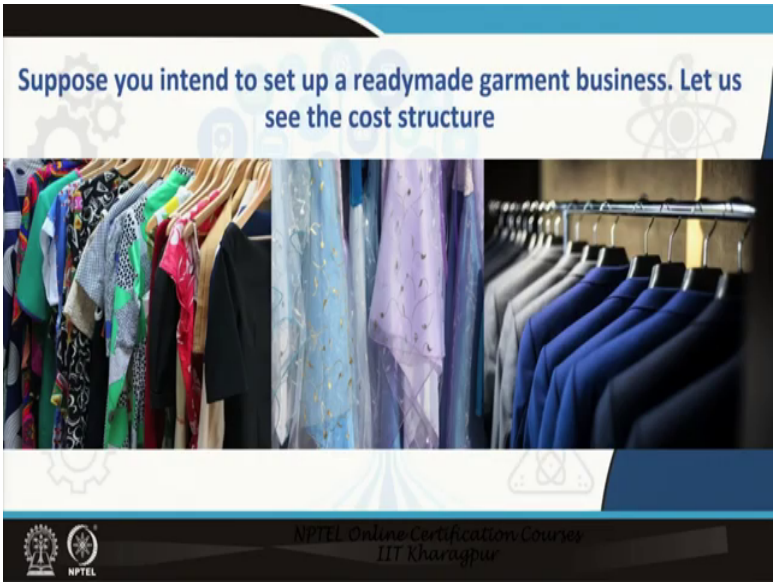

Let us start a readymade garment business. So you need cloths you need so many other things.

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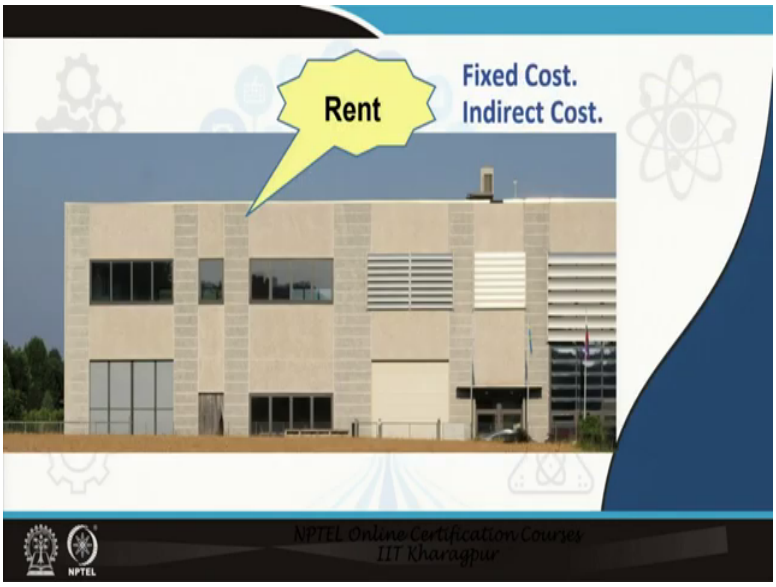

Let us see what all you need. Now you need a premises for performing this business executing this plan.

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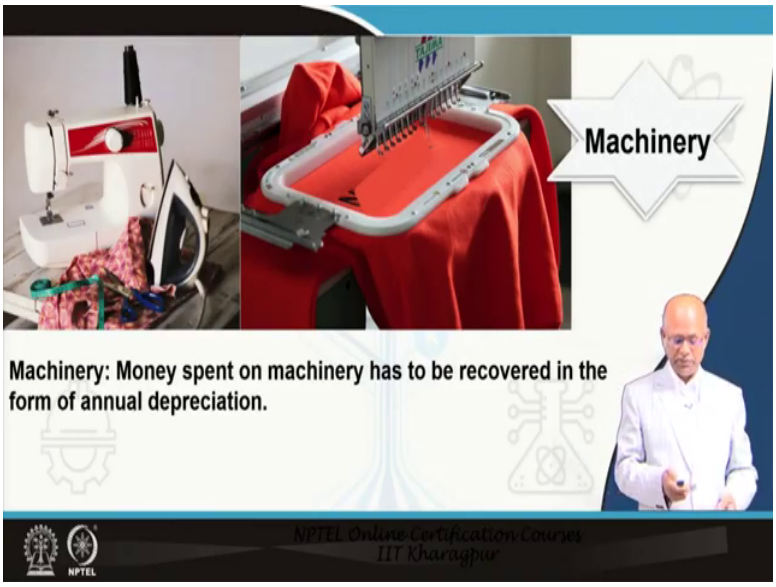

Now, you have to pay rent. Rent is a fixed cost because you have to pay rent every every month, every year. Similarly, you need machineries, depreciation; machinery contributes to your manufacturing. So it has to be recovered, cost of machine is to be recovered. How much to recover? Whichever component of the machine you are using arm? Which is nothing, but depreciation. Depreciation is that part of the machines which you are using up during the year. So you recover that part. That is a fixed cost because the depreciation is annual.

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So hypothetically, suppose your rent is 1,20,000. Your depreciation is 15,000, your administrative overhead meaning selling expenses, your salary to administrative staff, accounting staff, etcetera, your security guard everything together is 5,00,000.

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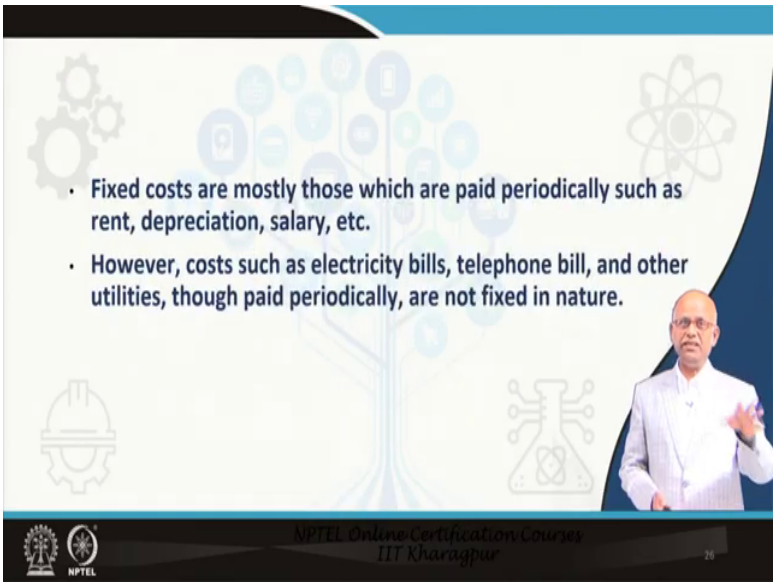

So total fixed cost for a year is 6,35,000. Notice that fixed cost is for year. It is estimated yearly. Fixed costs are mostly those which have paid periodically. Like say, rent like many things. But some items are paid periodically, still they are variable. Like say electricity bill, telephone bill, utilities like water; so, it will pretty much depends on level of operation, with the same time you actually pay them periodically.

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So be careful, but mostly they are periodic in nature. Variable cost: all materials that go into producing your garment is variable cost.

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So materials such as cotton or say cloth and then buttons then other is say threads etcetera, the salary of the person. So all these together make up the total variable cost. Now if you are manufacturing 1 shirt, you incur 1 set of all these expenses. You manufacture 2 shirts, you have just doubled that. You manufacture 20 shirts, you incur 20 times of that. Suppose the cloth cost you 400, button cost you say 20, your thread cost you 10, salary is 100, your total cost is 530 rupees for a shirt.

Now if you manufacture 2 shirts, its going to be 2 times 530. 1060. You manufacture n number of shirts your total variable cost will be n into 530. But remember, we estimate unit variable cost for our purpose of break-even point analysis.

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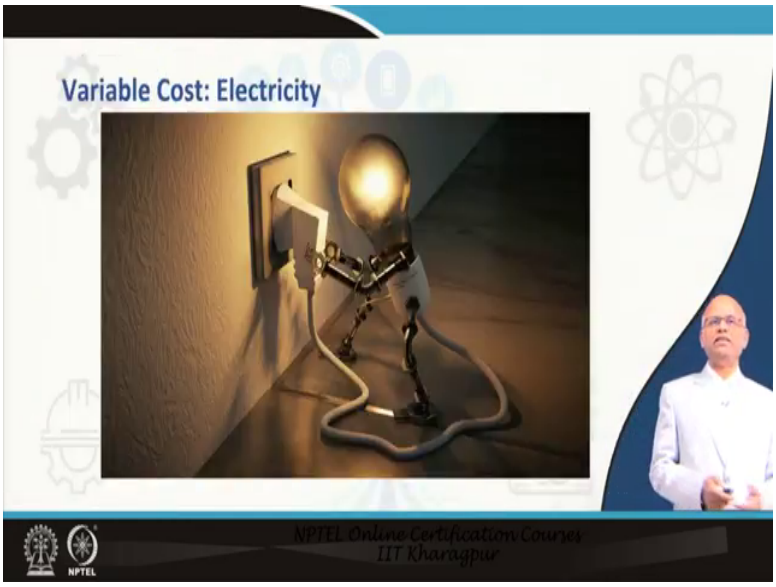

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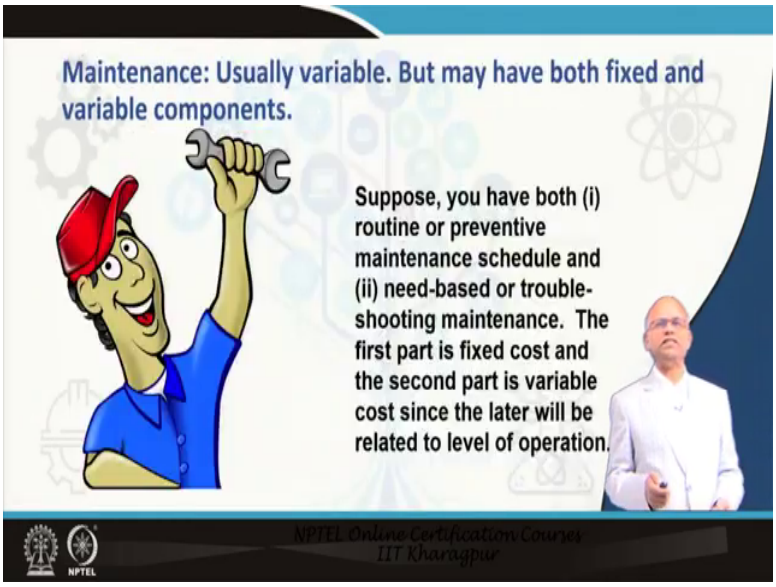

So salary is a variable cost, electricity is a variable cost. Maintenance may have 2 components like preventive maintenance that you do on a periodic basis like 3 months, 4 months or annual or whatever, that may be constituted as fixed amount every year you incur and then there may be troubleshooting. Sometimes something is happening and then you send the maintenance guy. So this may be a variable cost. Like you need some components, time and again.

Fixed component may be annual maintenance contract. You give the contracts. Suppose you have a Xerox machine. The company tells you that you have to pay this amount of money and my engineer will go there, repair and come back. So that is fixed. But then you may have another guy who is kind of based on demand, you invite him and then he charges.

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Similarly, insurance. For plant machinery, insurance may be fixed, for working capital in insurance may be variable. So depending on train, we have to identify. Suppose for the last 5 years insure among for insurance expenses say, 40 percent is fixed, 60 percent is variable. So for future, you assume that way.

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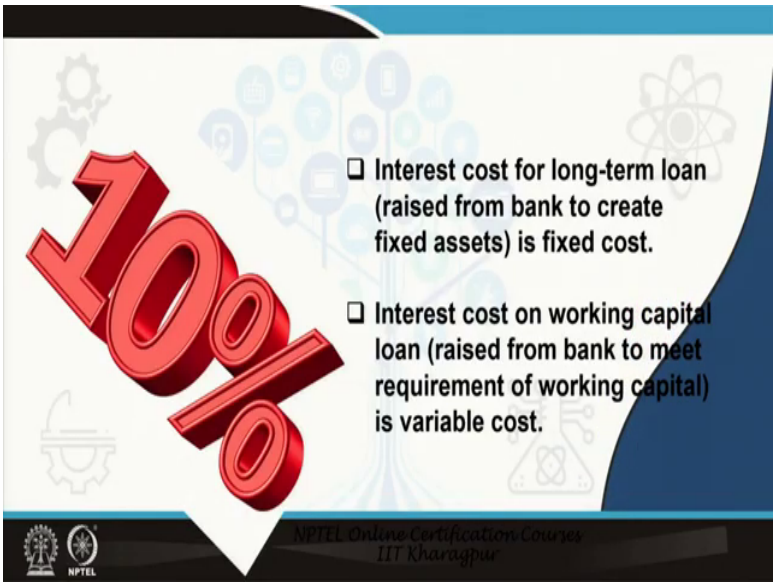

Similarly, interest rate. For short-term loan, which depends on level of operation, this is variable cost, interest is variable cost. For long term loan which does not vary with level of operation, that is a fixed cost.

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Consumable is fixed cost like say, caller is on consumable then thread, then buttons, then many other things. Consumables these are actually raw material, consumed if you talk of consumable mostly here the machine oil is a consumable. Likewise, there may be other consumables like a spare parts, some spare parts goes wrong sometimes so that may be consumable.

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Packaging and delivery is definitely variable cost because for every shirt, every garment you are going to pack it in a packet. So it is directly proportional to level of operation. That is variable cost. Delivery also is variable because every component has to be delivered.

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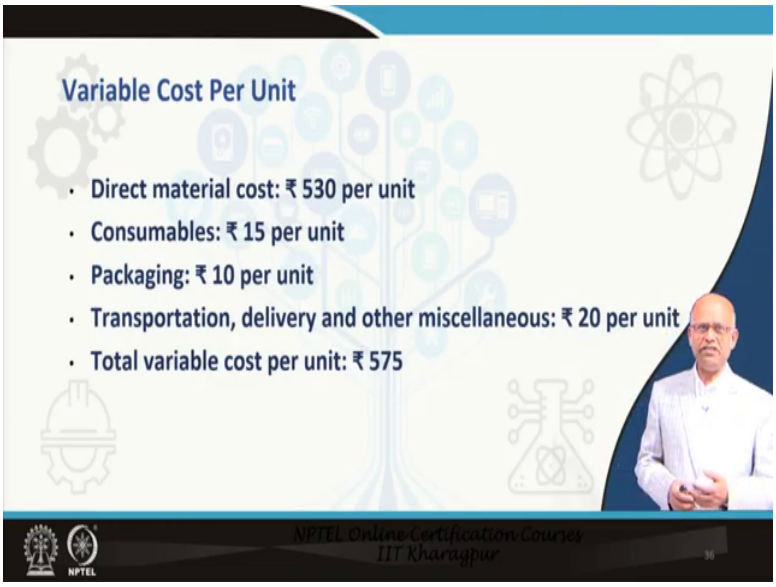

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Now variable cost per unit we have already found that direct material cost is 530, consumable is 15, packaging 10 transportation is 20 so total is 575. Earlier, we saw 530 as the as the in input cost.

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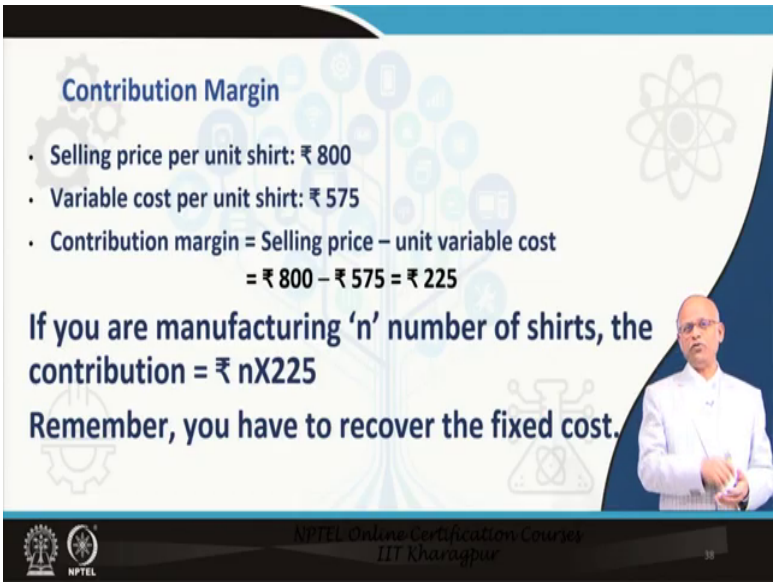

Now any cost that is proportional to the level of activities, this we have already defined. Now suppose, that you will be selling this shirt for 800 rupees now there is another term this could have been discussed after break. Even just to mention that your total variable cost is 575 whereas, the price is 800 rupees, we are still not considering the fixed cost. The difference between price and unit variable cost is called contribution. Contribution margin, contribution is the total contribution by all the units that you sell.

So here, contribution margin is 800 minus 575 is equal to 225 whereas, total contribution is n multiplied by 225 because you are selling n number of units.

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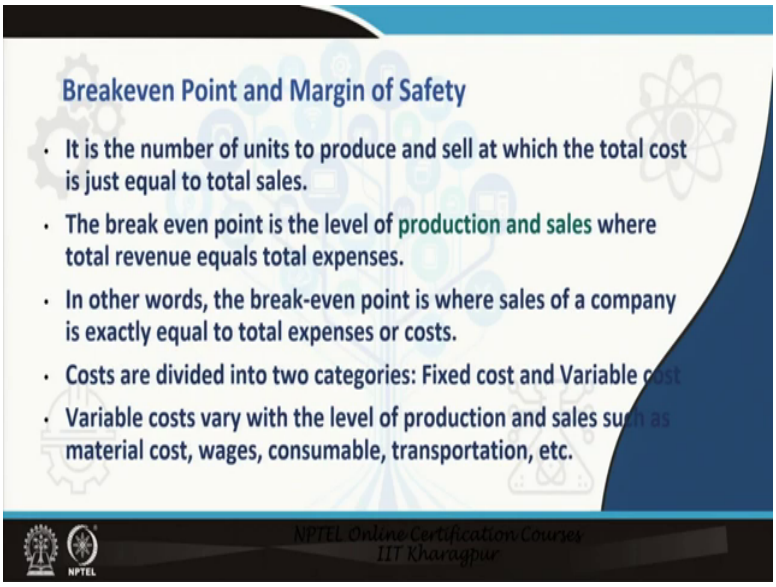

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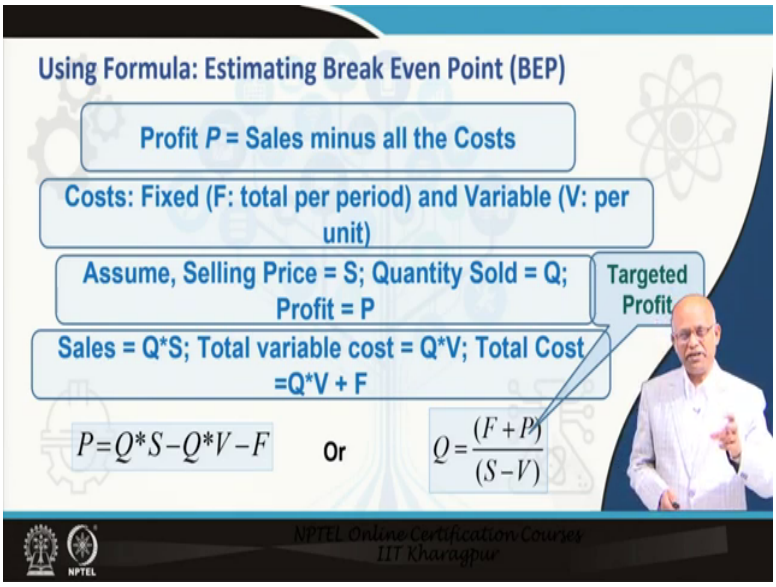

So we have now we have this idea about the about the mix of this. Let us just directly move to break-even point. Say you define profit or assign P as profit. Sales minus all cost and F as fixed cost V as per unit variable cost, selling price as S, quantity sold as Q profit is P. So sales is Q star Q multiplied by S. Whereas, total variable cost is Q quantity multiplied by unit variable cost that is V. Total cost is Q V plus F.

So profit is equal to total sales minus total variable cost minus fixed cost, annual fixed cost. So this is the formula for Q meaning the quantity that is to be produced for a certain profit, you have a profit target you identify quantity.

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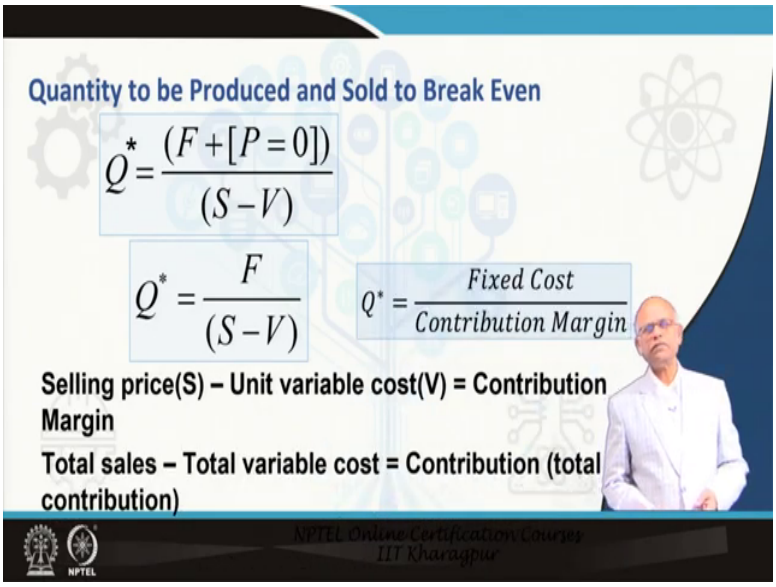

Now, if you want to estimate the quantity at which the profit will be 0, that will give you the break-even point. So substitute P is equal to 0, you get Q star Q star is nothing, but F. F is fixed cost divided by sales or selling price minus unit variable cost. That means, contribution margin. So fixed cost divided by contribution margin is variable cost.

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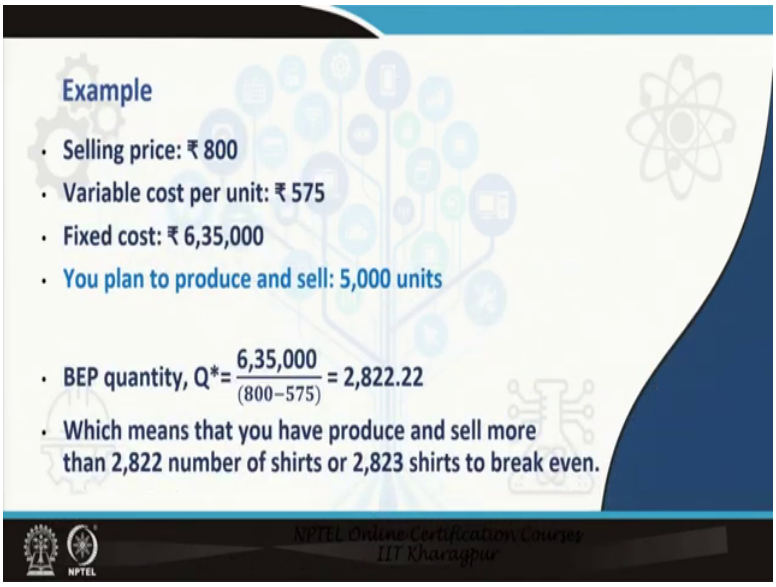

Now put the data here, whatever we have selling price is 800, variable cost is 575, total fixed costs annual fixed cost is 6,35,000, put the data you find that it is 2,822.22. So it is not 22. If you produce 2,822, you are going to incur loss because you have to produce even something more. So do not go in to fraction, just add 1 to that. So you have to manufacture 2,823 shirts to break even.

Thank you very much we will continue in the next slide. Read re we will discuss again all those basic concepts.

Thank you.