Entrepreneurship Essentials
Prof. Manoj Kumar Mandal
Rajendra Mishra School of Engineering Entrepreneurship
Indian Institute of Technology, Kharagpur

Module - 08
Lecture – 40
Cost, Volume, Profit : Break-Even Point Analysis – II

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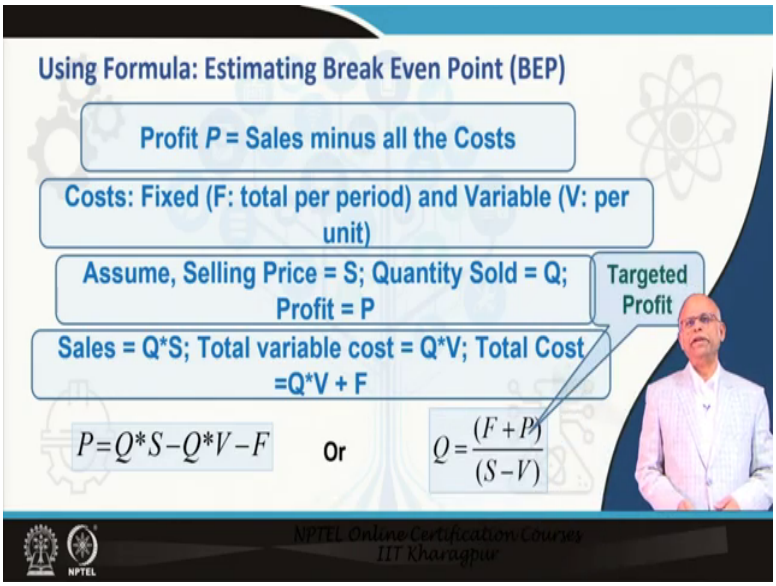

Welcome. We discussed about Breakeven Point the preliminary discussion and then we will continue in this session about further on breakeven point. So, we saw that the formula for breakeven point is very simple, just quantity to be produced and sold to breakeven is fixed cost divided by sales minus selling price minus unit variable cost. So, that gives precisely the formula for breakeven point.

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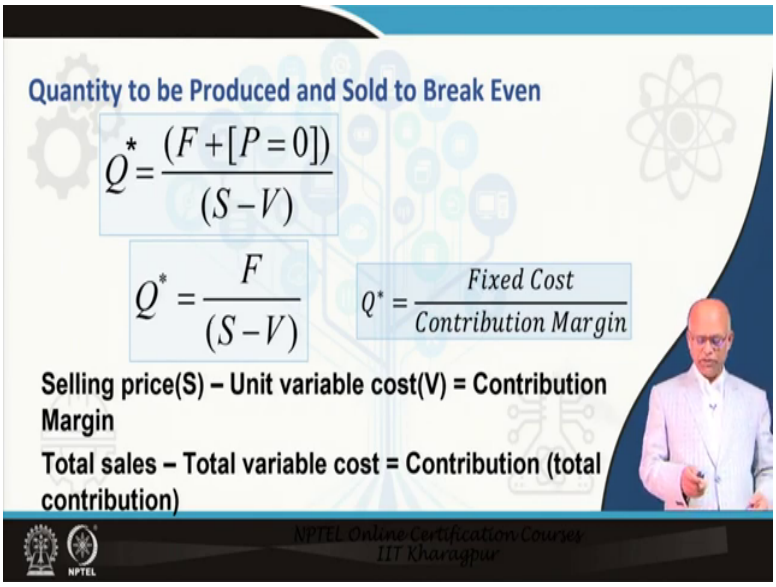

Now, we have introduced the term contribution even though we have not used it in our estimation.

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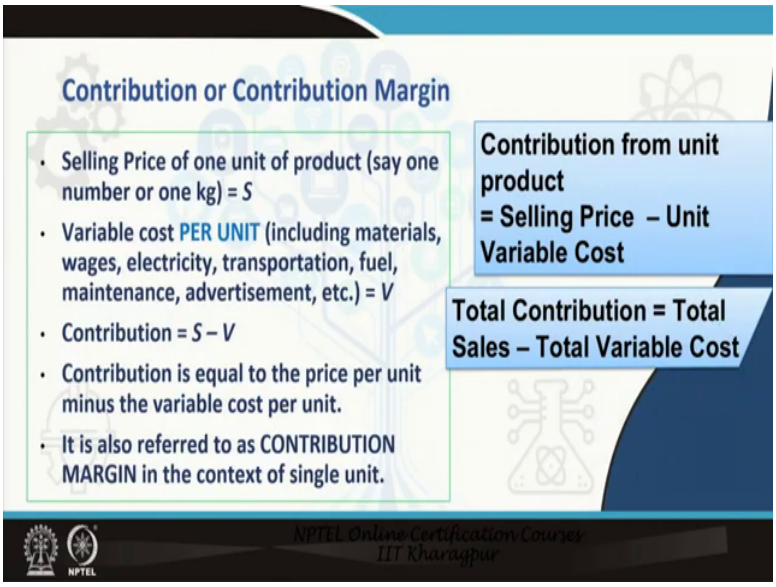

Now, we elaborate on this part, contribution and contribution margin. Contribution margin is nothing but selling price minus unit variable cost. So, that is a contribution margin and total sales minus total variable cost is contribution.

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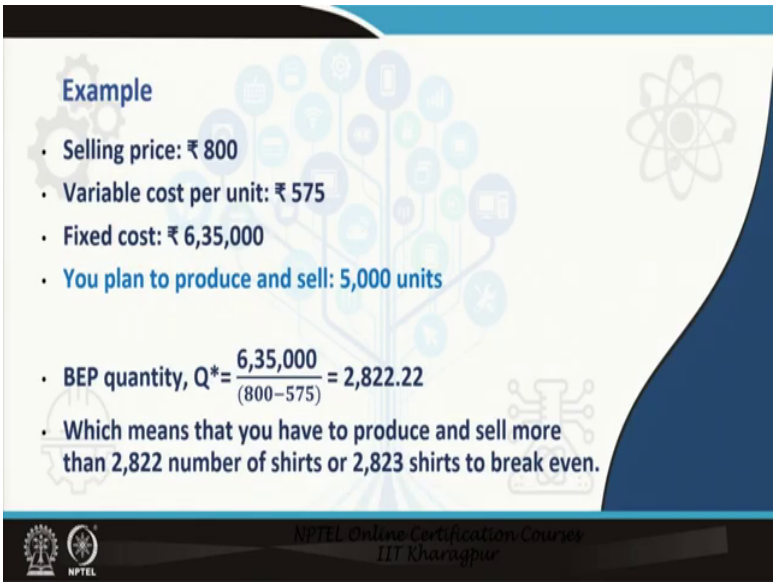

So, taking Q from that example our breakeven point was 2,823 number of shirts to breakeven.

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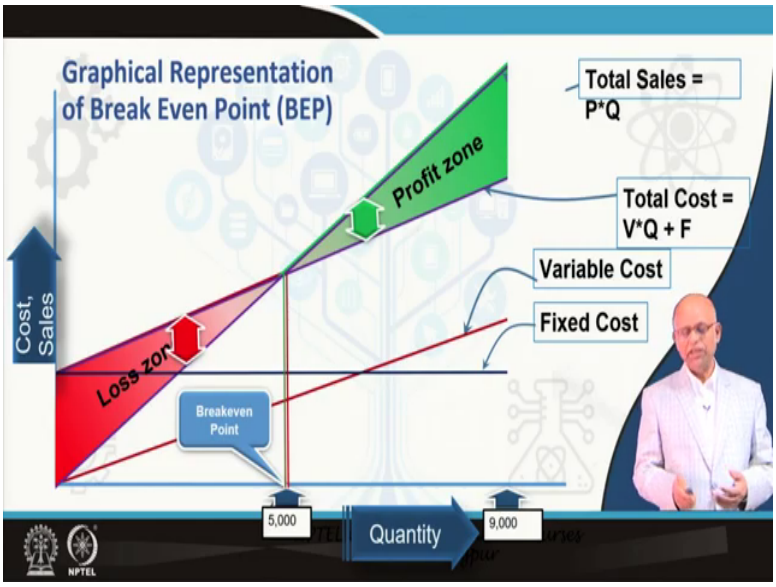

Now, we try to show that graphically. So, on a plot of cost versus say quantity cost and sales versus quantity your fixed cost line is a horizontal line whereas, variable costs start from 0 because if you produce 0 unit you do not incur any cost whereas, if you do not produce any unit still your fixed cost is at full F.

So, fixed cost even at zero is full and then it goes like a horizontal line. So, fixed cost never changes. In reality fixed cost actually changes, but this is an assumption that we make otherwise estimating breakeven point would be very complex. Now, these are the two total cost. So, if you combine the two you get total cost. So, this looks like the total cost variable cost is added to fix cost it becomes total cost and sales also starts from 0 and then eventually it has slightly higher slope because the slope of sales curved line is equal to unit selling price and the slope of variable cost line is equal to unit variable cost.

So; obviously, unit variable cost has to be lower compared to unit selling price otherwise you do not make any profit any time. So, there is no question of preparing a breakeven point or breakeven point analysis. So, slope of sales line is definitely higher compared to slope of variable cost line.

Now, where the sales line intersects with the total cost line it is called known as breakeven point. So, this is the breakeven point and lower if you operate at a lower capacity then you are operating in the loss zone, lower the capacity utilization lower higher is the loss, if you operate it at a higher level then you make higher profit the higher you sales the profit goes up.

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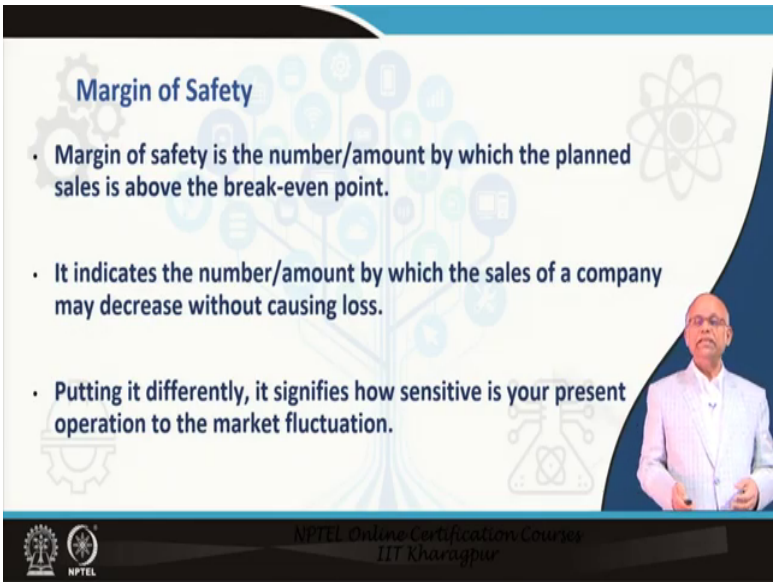

Now, from that calculation we have started we will estimate the margin of safety. Margin of safety is nothing, but the difference between where you operate and where the breakeven point is in terms of number of units that you sell.

So, if you are operating at a higher position compared to breakeven point you are at a positive margin of safety, while you are operating if you are operating at a lower level you are operating at a negative margin of safety.

So, margin of safety actually is number or amount by which the sales of a company may decrease or increase without causing or may decrease without causing loss. Suppose you are operating at say 9000 units per year your total sales volume is 9000 unit your breakeven is 5000; that means, your sales can go down up to 5000 without really inflicting any loss to you.

So, this difference between 9000 and 5000 is the margin of safety. Putting it differently it signifies how sensitive is your present operation to the market fluctuation.

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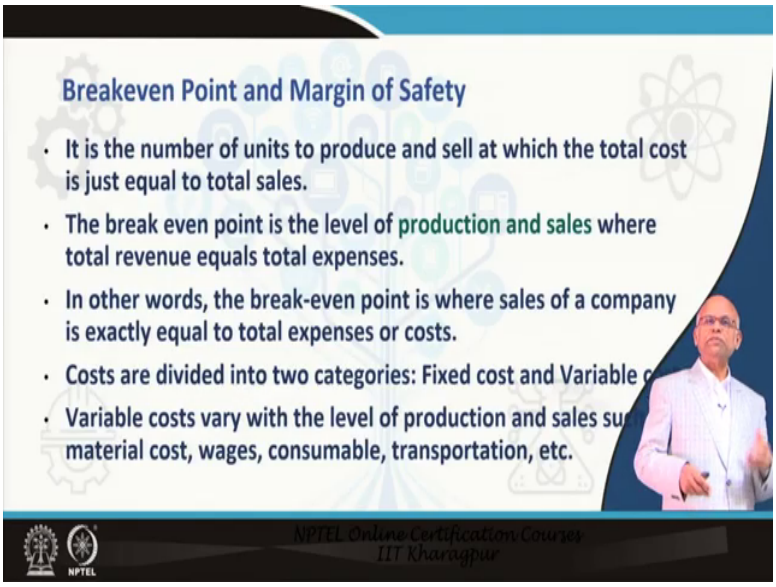

If the market situation becomes adverse still your sales may go down by 4000 unit without inflicting loss. It is the number of unit to produce and sale at which the total cost is just that is the breakeven, the breakeven also is the level of production and sales were total revenue equals to total expenses.

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We have already discussed them. So, margin of safety is the last line here our breakeven point was 2,823 units whereas, we have projected a sales of 5000 units. So, our projected sales minus the breakeven point gives us the margin of safety which is 2,177.

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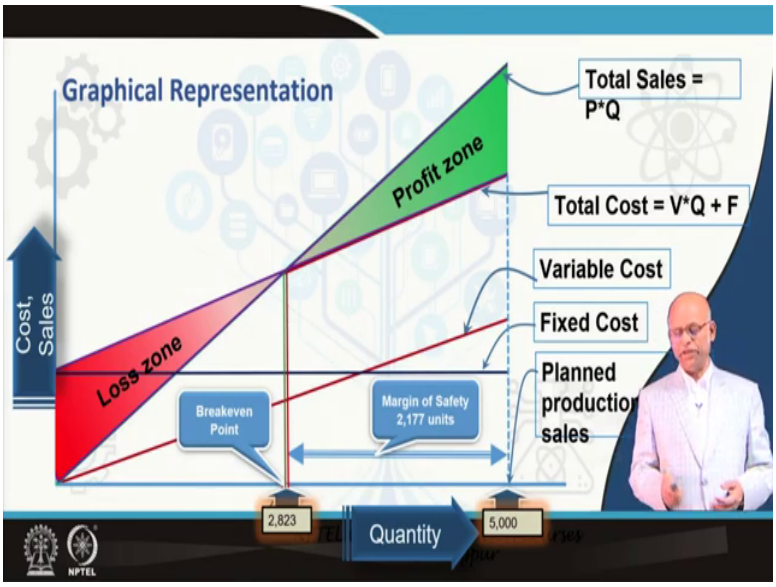

Here is the graphical representation of that margin of safety in particular.

So, we are our breakeven is 2,823 and we are operating at 5000 and here are all the fixed cost variable cost and sales line and this is the margin of safety which is 2,177 unit this is very important because future is uncertain, you make some prediction or forecast of yourselves based on your data market data that market is situation is like that if we produce this many units perhaps we can sell, but then there is always uncertainty.

So, you feel comfortable that we have a cushion like our margin of safety is 2,177 unit. So, we can perhaps even if the market situation is bad we can afford to remain in profit. Now, very important thing is that breakeven point analysis is based on many assumptions and these

assumptions are quite serious assumptions, meaning that almost every point has some adverse implication or the other.

Here the first assumption is all the cost can be divided into two part; that is fixed cost and variable cost not very serious we can always do that and if there are little bit of a say approximation it really does not cause much of a trouble because eventually we want to recover all the cost. What can actually seriously affect is the linear relation assumption meaning that variable cost will increase linearly, sales will go up linearly it may or may not because if you sell more you may have to reduce the price.

So, with volume if you plot the sales come may curve may actually be slightly downward tapering. So, it may go down slightly means go towards means it may not be a straight line, but go downward because of volume sales because of your other parameters. This is also true in case of variable costs sometimes variable cost actually may go down because of volume, because if you have if you buy more raw material then you may get at a wholesale rate Whereas if you buy a smaller quantity then your price may be higher.

So, there is always a quantity that is known as economic quantity or a meaning suppose you buy a truckload of goods your transportation cost will be the rent of the truck. Now, you buy half the truck your transportation cost remains the same it is divided among less number of items economic what are quantity is the term was looking for.

Volume is the only cost driver for variable cost this is again another assumption, relevant range of volume is specified within which assumptions held. Relevant range is there is a is a range relevant means the period relevant period is the period of say year or month or quarter or half year there is a relevant period.

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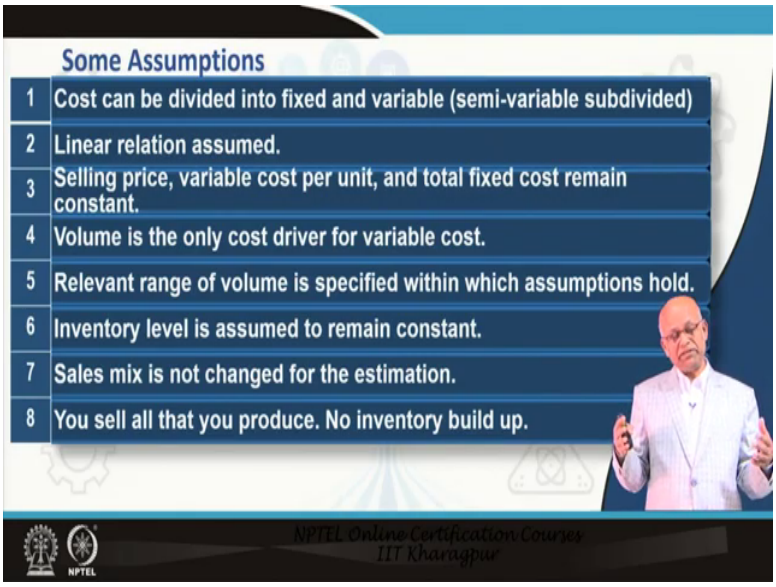

Now, inventory level is assumed to remain constant there is no inventory built up meaning that whatever you produce you sell the same; that means, there is no built up of in buildup of inventory. In reality inventory we may go up may go down meaning that you may sell more than you produce you may sell part of the things that you inherited from the previous year. So, there is this approximation.

Sales mix is not changed sales mix means you are not manufacturing just shirt you are manufacturing some other products as well say ladies garment. Now, for ladies garments your variable cost to fix cost relation may be slightly different compared to that of the shirts.

So, if you make an make a average of the of this cost and average of the fixed cost variable cost and fixed cost this may lead to some kind of serious approximation that may not hold,

but then this is an assumption that we have to live with meaning that sales mix will not change during the period relevant period.

So, if you are manufacturing say 60 garments and 40 shirts, 60 to 40 percentage we presume that this ratio will remain same otherwise it will go everywhere because the ratio of fixed cost and variable cost is going to change that formula will not hold.

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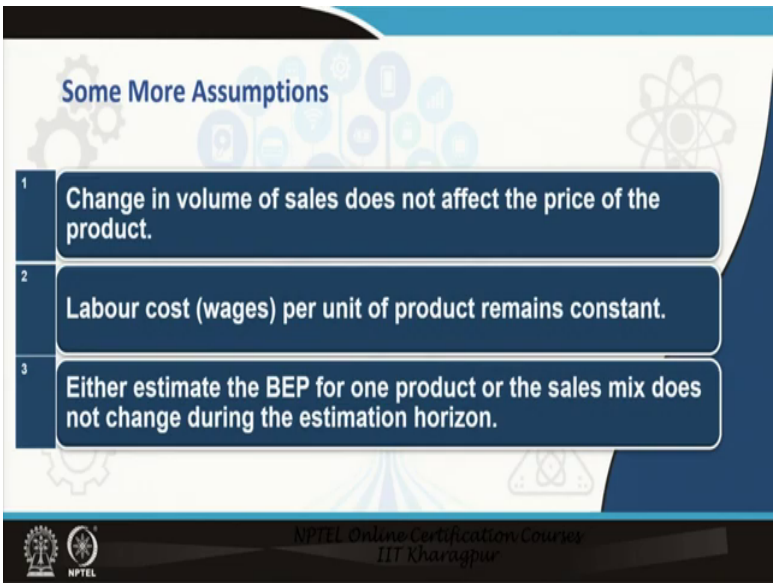

So, inventory buildup is not going to happen we have presumed that. Change in volume of sales does not affect the price that is another assumption as I said that sales line will be a straight line. Labor cost per unit may or may not remain the same, but we presume that it will remain same.

So, either is in case you are manufacturing several products. So, there is a mix of product or sales mix. Then either estimate BEP for one product at a time separately by defining its separate cost structure meaning proper allocation of fixed cost and then estimate BEP for separately for that product each product separately or presume that there is no change in product mix in between.

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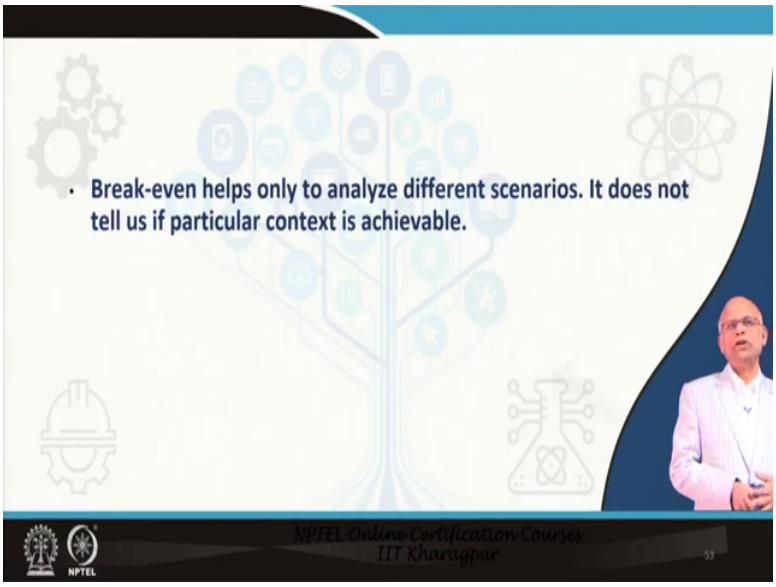

So, from assumptions it may appear that breakeven point is be sorted with assumptions with which may or may not realistically be possible to achieve. But then another point is that we have hardly anything better before us to make this kind of estimation and get a sense of the thing that breakeven point gives us. And even though there are two large number of assumptions experience suggests that breakeven point analysis is meaningful and useful. So, we have to live with it and this is something that we cannot do away with.

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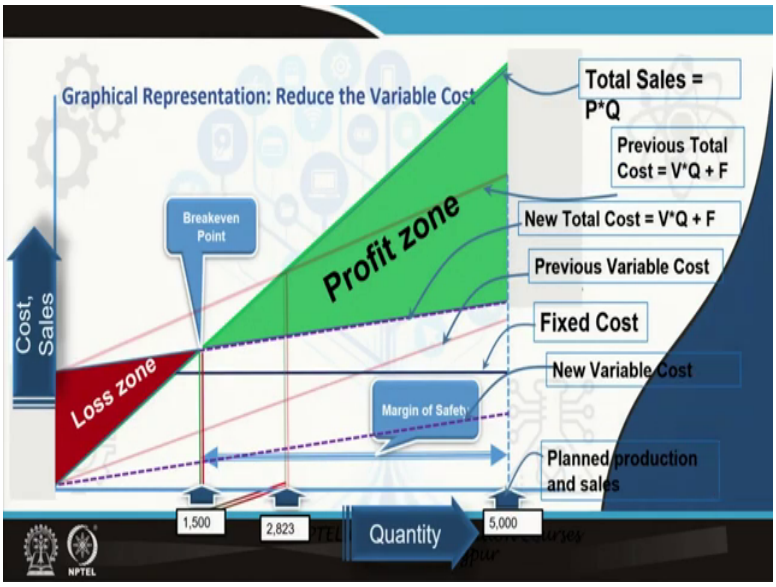

Now, suppose means what are other context where breakeven point is applied. Breakeven point is applied specifically and there is no alternative, but to apply breakeven point in those cases where we compare between two scenarios say you have the option of putting an automatic plant we say we another plant would which is labor intensive this is not automatic.

So, if you are going to put up an automatic plant, then you are your capital cost is going to go up, your depreciation is going to go up, the interest on term loan is going to go up. So, your cost of structure is going to go up significantly whereas, because its an automatic machine the losses will be less time requirement will be less, so labor cost will be less. So, much of the variable cost will be less.

So, by changing the technology you are changing the cost structure whereas, in a labor intensive project by the title itself labor cost is more in this case whereas, fixed cost is less

because your machines are not costly. So, these two context are very different. Now, if you have to make a decision as to which one to buy? It is going to be very difficult just to try to estimate back of the envelope as to which one is better perhaps we will not reach to an agreement that this is better or this is not.

Whereas if you can classify the cost correctly do a breakeven point analysis you can easily identify which one is better. So, let us see in the first example we will assume that fixed cost remains the same whereas, variable cost changes any case hypothetical, but then we presume that variable cost remains same how the breakeven point changes its intuitive, but still I am just showing.

So, in the first one you see the breakeven point is coming down to 1,500, if the variable cost which is there the pink line comes down to the purple line dotted purple line. So, if variable cost comes down fixed cost remains the same your breakeven point is reduced to 1500 from 1,823. Now, that you are projecting to sell 5000 units your margin of safety is 3,500 which is 5000 minus 1500.

So, that is how breakeven point changes with change in variable cost. On the contrary if the variable cost will be going up the breakeven point will move right word because the slope of the cost curve is going to go up and it is going to touch the sales for sales line much beyond that point.

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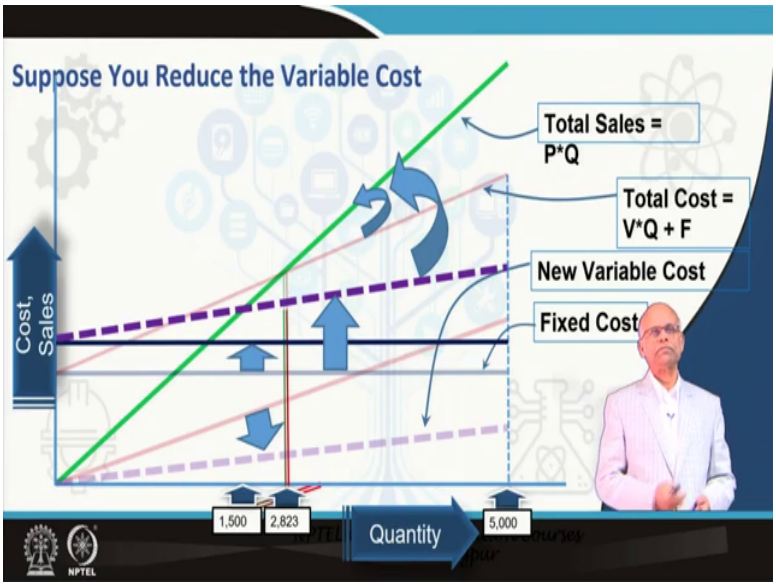

Suppose you would reduce variable cost as well as you increase the fixed cost, the example that I just now gave that is you are going for automation. So, your fixed cost goes up and your variable cost goes down. So, if that is the structure, then what happens? One is because your variable cost is going down. So, initially your breakeven point actually may reduce it be attractive because variable cost is low, but then your fixed cost line is going up, so eventually your breakeven point again moves right word.

So, it may act where it will be that will depend on the data unless you put the data its very difficult to say where eventually lies the breakeven. So, with some data at your disposal you can decide whether automation is better or you should we said you would settle with a labor intensive context.

So, here is the two lines; one is the new brief variable cost line the other is the new fixed cost line and this is the total cost line and breakeven point is shown to come down, but it may or may not it depends on the value; how the fixed cost suppose the fixed cost actually go up even further then things are going to be very different.

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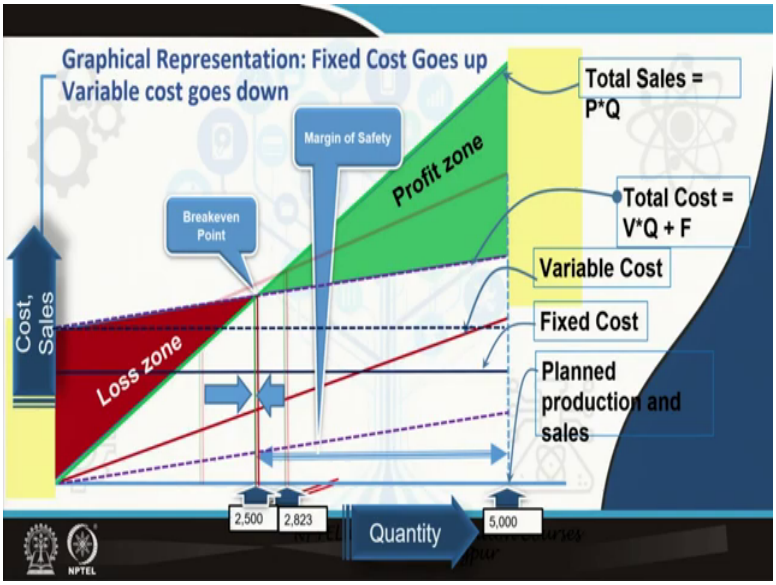

Now, this is shown and this in the same, but then showing the profit zone and the loss zone.

So, our breakeven point actually goes to say 2,500 these are all hypothetical data there is no calculation done here.

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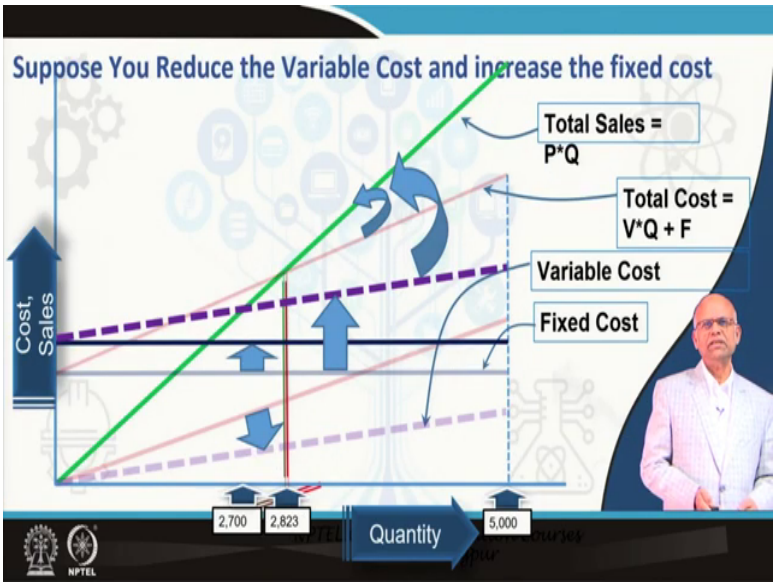

So, same thing just repetition of the slide for whatever reason.

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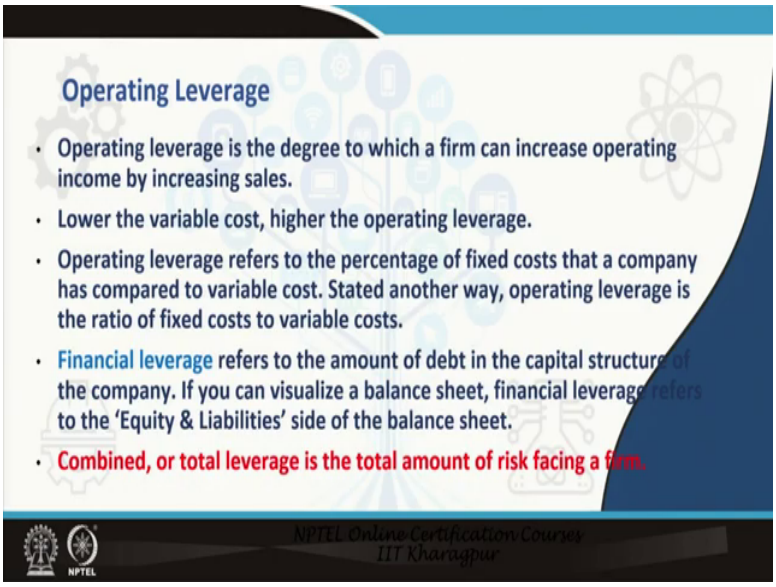

Now, there is another item called operating leverage. Operating leverage is the degree to which a firm can increase operating income by increasing sales.

If you if your fixed cost structure is a fixed cost is very high you have high operating leverage you make more profit by selling single unit incremental unit beyond breakeven point. Operating leverage refers to the percentage of fixed cost that a company has compared to variable cost stated another way operating leverage is the ratio of fixed cost to variable cost.

Then there is another leverage which we perhaps did not discuss during financial statements leverage per se is kind of used in terms of multiplication factor sometimes its good, sometimes it is not so good dictionary meaning will tell us that leverage is you can use certain connection certain strategic items to your advantage.

Suppose you in physics leverage is liver there is something called liver where you can use a stick put a fulcrum closer at to one end using that stick you can push something heavier than normally whatever you can do. Financial leverage before financial leverage, suppose speaking from literature point of view suppose your some relative is known to some minister.

Now, you need a license and you use that relation to get a get to reach out to the minister and suppose you get it. So, you are leveraging your relation of your uncle or somebody with the minister this is called leveraging in financial leverage it is actually other way around financial higher the financial. Leverage higher is the date of a company leverage actually means how much the company is indebted to banks how much of the date that the company has raised from the bank compared to their equity.

So, date to equity ratio is a leverage ratio. So, if your company is highly livered that shows that the company has raised lot of loans, if it is not highly levered; that means, the company has raised smaller loan they can go for more loan if capital is necessary, we can visualize a balance sheet. Financial leverage is the equity and liability side of the balance sheet.

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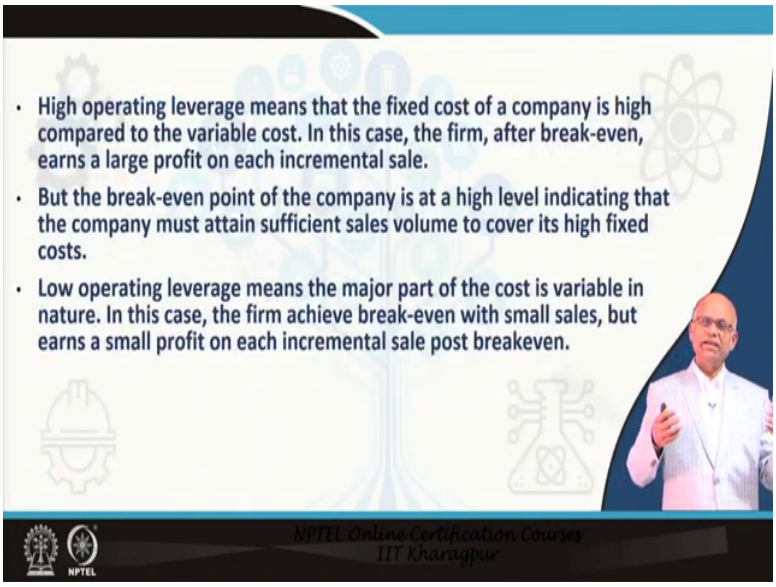

And combining operational leverage and financial leverage you get a sense of the risk paradigm of the company. High operating leverage means fixed cost is very high compared to variable cost. In this case the firm after breakeven makes more profit, but then there has to be market to sell more only then you make more profit. So, you need to understand the market only then you decide that high leverage is something that we go for.

Low operating leverage means major part of the cost is variable in nature. In this case the firm achieved breakeven with small sales, so breakeven point is lower. So, if suppose market size is not. So, large low operating leverage makes sense because you operate at a lower level because market is small, but then still you make profit because breakeven is low.

So, if the same variable cost is high compared to fixed cost, then the slope of the cost total cost line is higher. So, it is coming closer to your sales and then they intersect early. So, that is why breakeven point is at a lower level.

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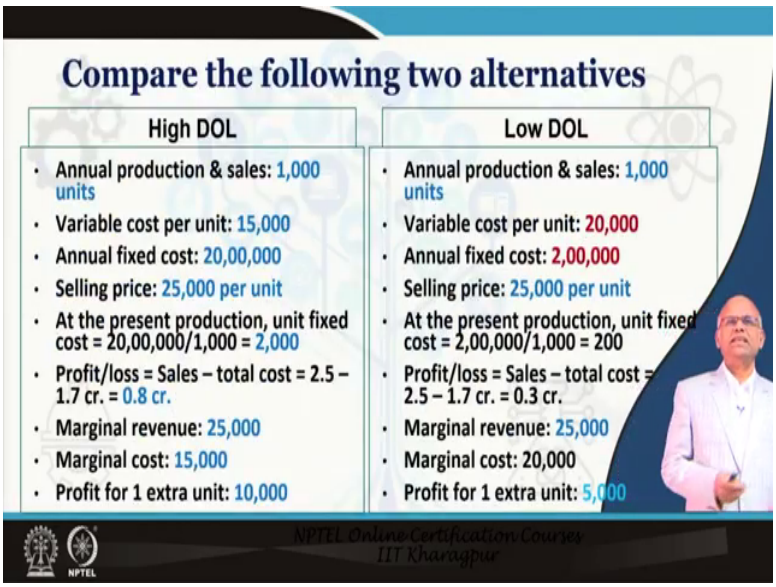

Here is an example compare this two scenario the same company, the same product same everything only they are comparing between two options two scenarios; one is they go for automatic machine. So, variable cost will be low whereas, initial investment will be high, so fixed cost will be high. On the other side variable cost is high whereas, fixed cost is low because they have a labor intensive unit.

So, presume that you are going to sell 1000 units in both options sales are 1000 and selling price also has to remain same because market is not interested to know whether you have

made it in automatic machine or labor intensive machine they are interested in the project product. So, selling price is considered to be 25,000 here and 25,000 there as well.

But because one company is operating leverage is very high that; that means, that variable cost is low which is 15,000 whereas, the other it is 20000, fixed cost is high which is 20,00,000 here 2,00,000 there. Now, you estimate profit loss at a level of say 1000 units you find that profit for high leverage high operating leverage company is slightly higher 0.8 crore whereas, it is lower at low operating leverage company that is not the important point. You estimate the breakeven point here and the breakeven point there.

Now, for every incremental unit your marginal contribution is 10,000 for high operating leverage whereas, it is 5000 in low operating leverage context; that means, once you breakeven you make high profit in this case you break low profit on the other case.

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Now, it will pretty much depend on the market condition whether market can absorb 1000 unit or not this is a perception that we have already made that we manufacture and sell only 1000 unit. There is another concept I will just finish it with this the cost indifference point. Cost indifference point is the level of production and sales at which the profit is indifferent of the two strategies with different cost structure.

Like we discussed about two different cost structure; one has high fixed cost low variable cost the other is low fixed cost and high variable cost. That means, the contribution also is different because selling price does not change, selling price is we are talking about the same product. So, selling price remains the same.

Now, if you plot the two suppose you are operating you presume that you are operating above breakeven point in both cases say you are actually making some profit in both case whatever that is. Now, you plot profit versus unit you will find that they will intersect at some point of time, initially one will give more profit the other will give less profit. It might so happen that one is giving loss the other is giving profit.

So, you plot that if it is lost plot on the negative side, but at some point of time we will find that they are intersecting that is the point where both the strategies give same profit, profit does not change that is that point is known as cost indifference point.

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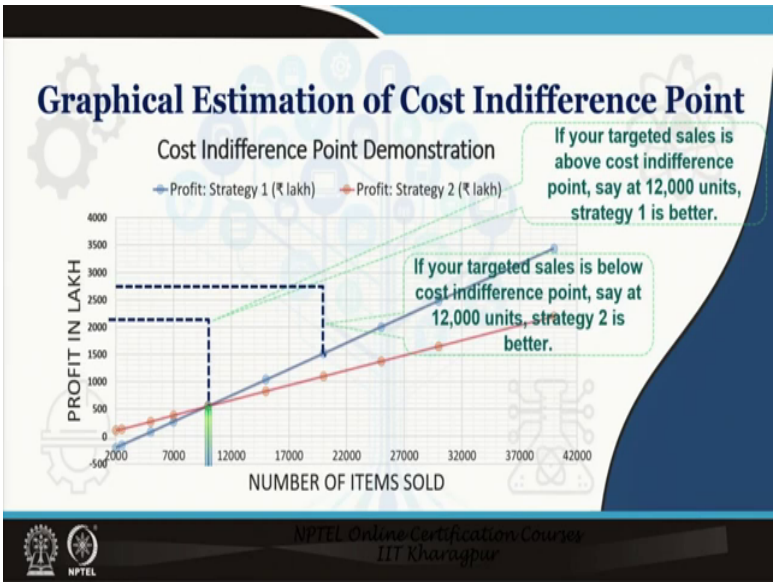

Let us show graphically. Suppose the orange line has a means has high margin at low capacity; that means, it has low marginal contribution that is why the profit is increasing slowly not compared to the other it is increasing slower.

Whereas the blue line has a higher slope, we can presume that it has high operating leverage, it has high fixed cost low variable cost. Why so? Because the profit or marginal profit is increasing in larger rate compared to the orange line for every incremental project this is going up. So, it is actually meeting at a point of sales something like close to 12,000 maybe something like 10,000.

So, 10,000 whatever is the number of unit where this two line lines are intersecting that is the profit indifference point or cost indifference point meaning that variable cost and fixed cost whatever is the ratio this point is not affected by that ratio profit becomes same for both the

units. Below that and above that profit will pretty much depends depend on the ratio of fixed cost and variable cost.

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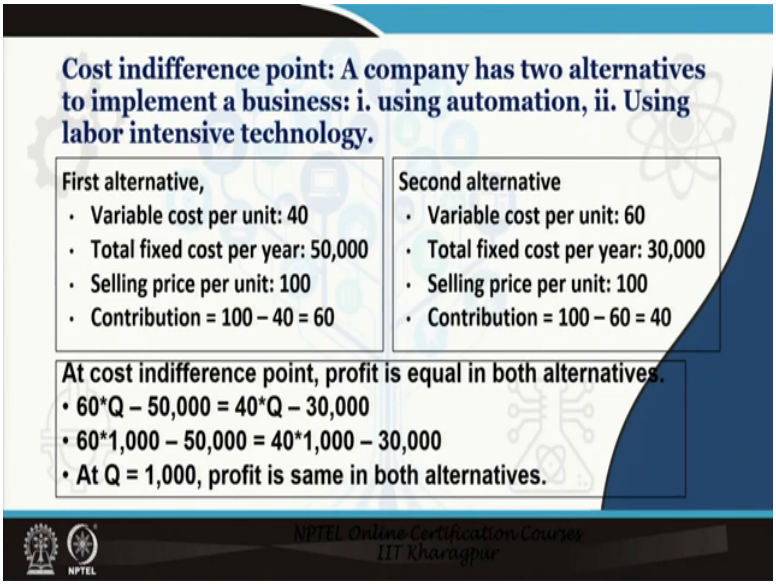

Now, let us have an example cost indifference point. Suppose same company they have one alternative where variable cost per unit is 40 rupees, the second alternative variable cost is 60 rupees, total fixed cost here is 50,000 total fixed cost there it is 30,000 they are different. Now, selling price has to be same because you are in the market place it does not depend on you, it does not depend on the cost structure. So, that is 100 rupees per unit.

So, contribution will be different in two cases; in this case contribution is 60 rupees per unit where contribution margin we should call whereas, in the second alternative contribution margin is only 40 rupees per unit. At cost indifference point their profit should be same. How to estimate the profit? Profit is nothing, but total cost sorry sales total sales minus total cost.

Now, we are selling how many units? Say Q in number of unit because we want to identify the number of units to be sold to achieve that profit indifference cost indifference point where, the cost does not depend on cost structure or profit does not depend on the cost structure. So, let us assume that we have to manufacture and sell Q number of products to attain that cost indifference point therefore, total sales is nothing, but selling price multiplied by Q in both cases.

So, in first cases selling price sales is 60 multiplied by Q and the fixed cost is 50,000 rupees. In the second case sales is 40 multiplied variable cost is; variable cost is 60 rupees, so 60 multiplied by 60 multiplied by Q is the sales minus fixed cost is or same actually the two lines are connected I got confused.

So, the in fast case the 60 multiplied by Q is the total sales minus fixed cost; minus variable cost variable cost is nothing, but 40 into Q. So, instead of equal to sign it should be minus 40 into Q and then the other alternative is that your selling price is 100. So, Q multiplied by 100 that is a sales minus fixed cost is 30,000 minus variable cost is 60 multiplied by Q.

So, left hand side and right hand side should be equal when you achieve the cost indifference point. And then you solve for Q you get Q is equal to suppose 1000; that means, if you sell 1000 unit in this alternative or that alternative first alternative or second alternative your profit is going to be same therefore, that is the cost indifference point.

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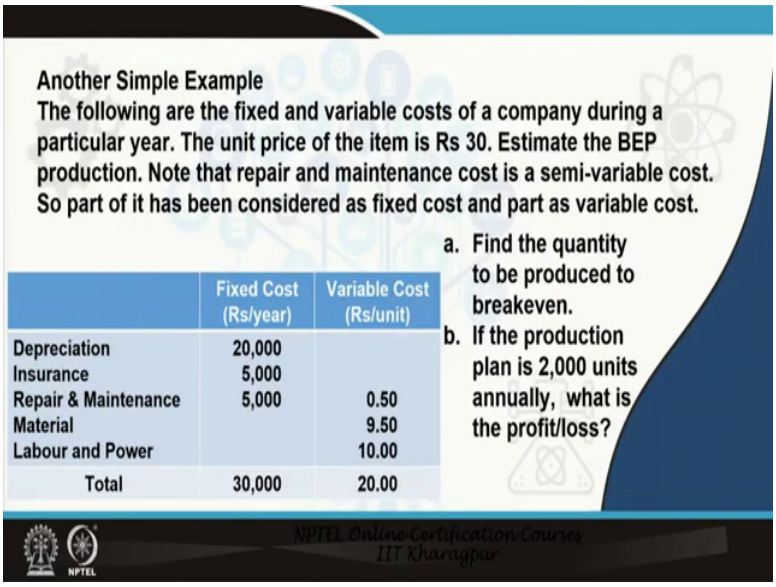

This is another example its not really a cost indifference point or operating leverage, it is showing how breakeven point can be used to make a sales projection or sorry a profit projection.

So, this is an example where cost is mentioned meaning fixed cost and variable cost are mixed up and shown to you your objective is to make breakeven point estimate breakeven point number 1. Number 2 suppose the company wants to produce 2000 units do they make profit or loss, number 3 if the company was to make certain amount of profit how many units the company must produce and sell?

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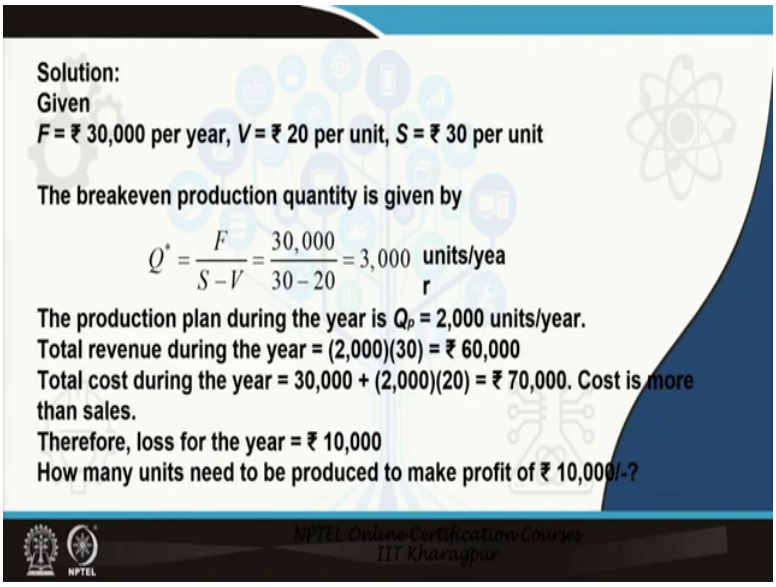

So, consider these three alternatives only two are written here another one will be later. So, we know the breakeven point formula just replace those formula you find that Q for breakeven is 3000 units per year. So, if you produce 3000 units you breakeven all the data are available F is equal to 30,000, V is 20 per unit, S is 30 per unit. So, breakeven point is this.

Now, suppose the question was that if the production plan is 2000 unit you actually here breakeven is 3000, so you can guesstimate that we are going to incur loss because we are going to produce 2000 unit below breakeven point. Now, you already know the total cost is fixed cost plus variable cost; fixed cost is 30,000, variable cost is 20 rupees per unit and you are producing 2000 unit. So, 2000 multiplied by 20 is 40,000 plus 30,000 70,000 that is a total cost.

What is the total sales? If you are selling at thirty rupees a prior unit and your total sales is 2000. So, you are going to sell only 60,000 rupees. So, your loss is 70,000 minus 60,000 which is 10,000.

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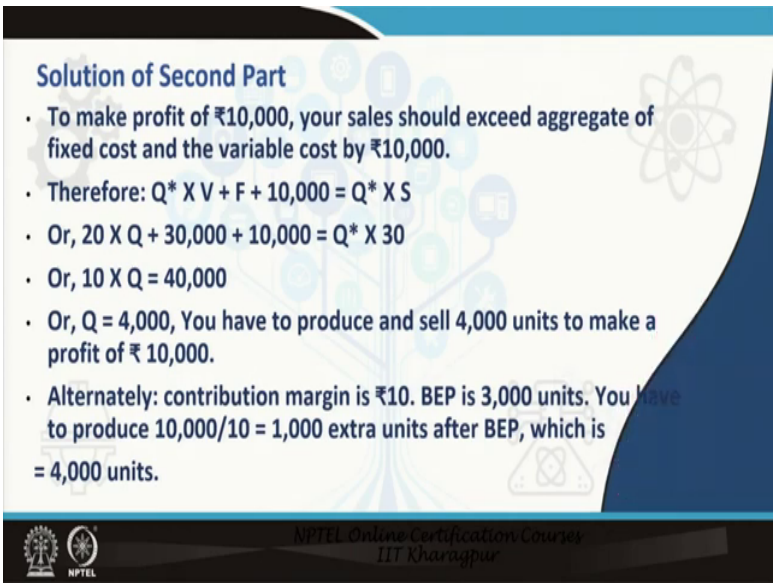

Now, suppose you want to make a profit of 10,000 rupees, how many units you must sell? here again the same formula your total cost is fixed cost plus variable cost and then if you have to make a profit you add that profit.

So, your variable cost is 20 rupees multiplied by Q is a number of; number of product that you have to sell to make a profit of 40,000, your fixed cost is 30,000, your profit is 10,000 this has to be recovered or this has to be taken from the total sales and your selling price is 30 rupees multiplied by the Q which you have to sold to make a profit of 10,000. Solve for it you

find 40,000; that means, you have to produce for 4,000 units produce and sell only then you can make a profit of 10,000 rupees, that is it.

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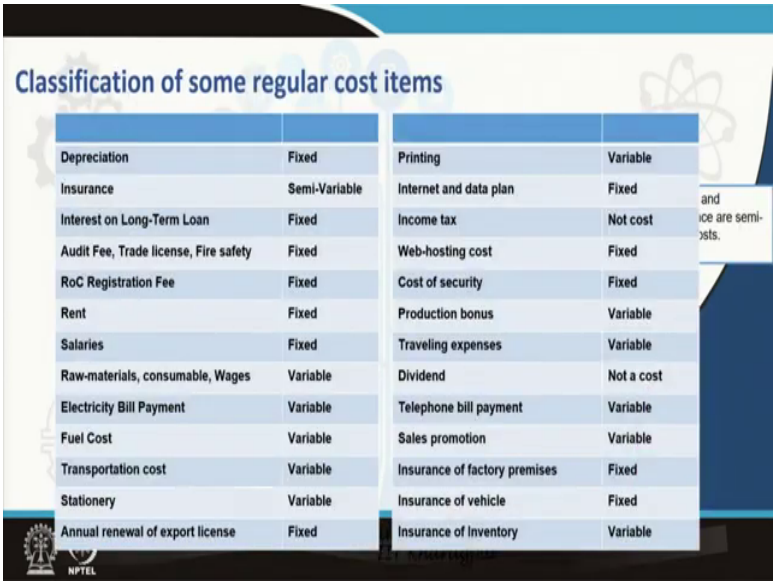

Then here is just a list of items for your reference as to which are fixed cost which are variable cost that is always some confusion, but remember some of the; some of the items have two both the components like say insurance, insurance of a vehicle is fixed, insurance of raw material will be variable, it will depend on how much of the raw material that you hold.

So, like maintenance also may be may have two components otherwise they are the same.

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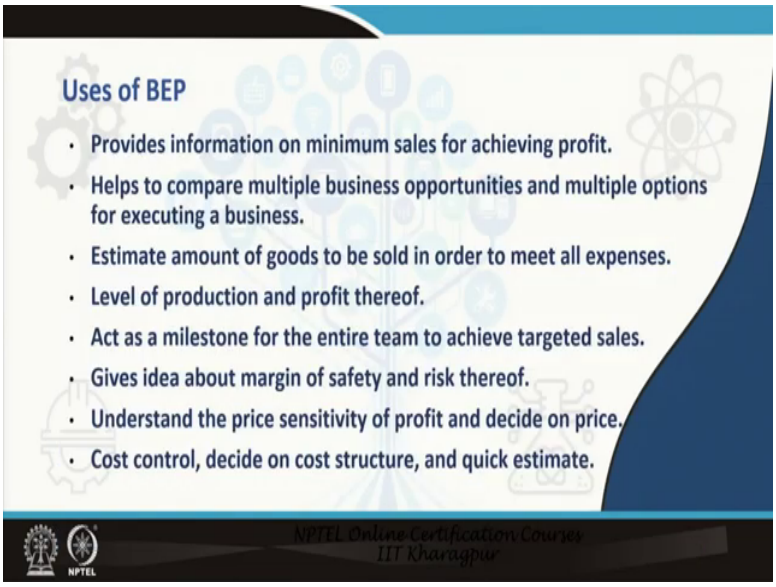

Now, there are many application of breakeven point we have already discussed in the beginning.

So, it provide information on minimum sales to achieve profit, then it helps to compare multiple business opportunities. You estimate the breakeven then you get a sense of which is better which is not then holistically you cannot decide estimate. Amount of goods to be sold in order to meet all expenses that is the breakeven point.

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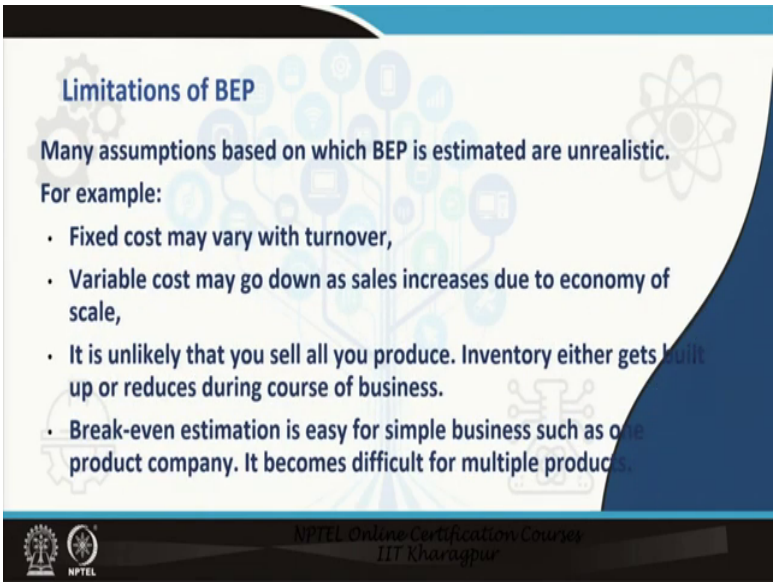

Level of production and profit thereof we have already discussed all of that, there are some limitation. Fixed cost may vary this also we have all assumptions are actually limitations.

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But then the advantage outweigh the limitation. Using it judicially is very helpful and it has been there for long time and it will be there we do not force see another model coming up and helping us to estimate all of that that can be done using breakeven point. So, particularly if I start up you have multiple opportunities you need to estimate use breakeven point handsomely holistically.

Thank you very much.