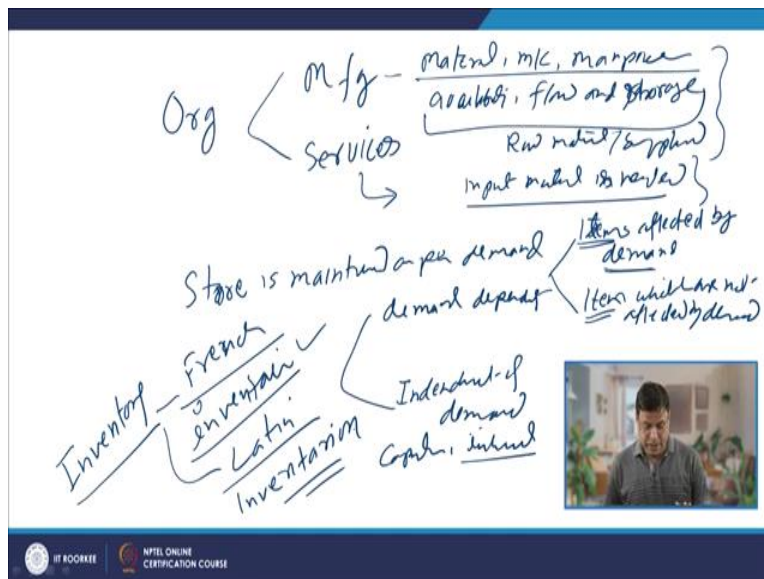


Principle of Industrial Engineering
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Lecture 36
Inventory: Fundamentals

Hello, I welcome you all in this presentation related with the subject principles of industrial engineering and you know we are talking about the production planning and control. Where in inventory of the items needed for smooth production or production of the goods and services is very important in this presentation basically we will be talking about the various fundamental aspects related with the inventory.

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So, we know that there are various types of the organizations will be involved in like say manufacturing or providing the services for manufacturing the goods so that they can supply it to the customers on demand. It is required that whatever material, machines and manpower needed for is smooth production that is made available. And therefore what is important availability, availability the flow and storage.

Especially of the raw materials and the supplies, which are needed for is smooth production become very crucial. Similarly, in production of services also these materials, machines and manpower will be needed. So, in services also, it is required that whatever input material is needed that is supplied on time whenever there is a requirement.

So, that the production of the services of the services are made available whenever they are needed as well as there is never the stock out kind of the situation. So, it is important that we have the things required either for manufacturing or for services in store. So, store is maintained as per the kind of demand which is there.

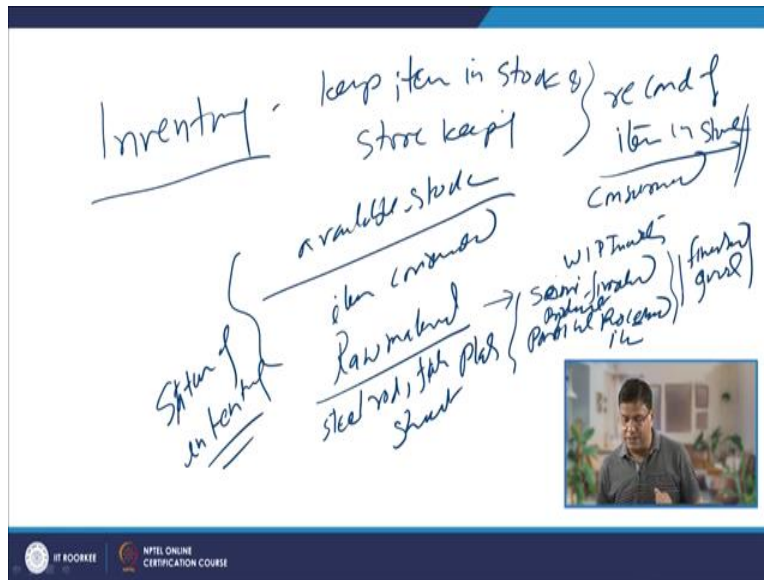
Now, there are certain items there are certain items which are demand demand dependent. So, the items, which are directly influenced by the items whose demand is affected by the demand means the items whose consumption is directly influenced by the kind of demand. So, like more production is needed either of the goods and services more consumables more materials will be required.

So, those items will be that demand dependent items. And there are items, items which are not affected by demand, so whether we produce a 100 units or 10,000 units the requirement of certain items that does not change with the kind of the demand of the kind of volume, which is to be produced.

So, the two types of the items one is the demand dependent. And another category of the items needed in store is the independent of the type of items which are independent of the demand or the kind of production which is to be done. So, in this category like the kind of the computers which will be there or internet facility to maintain the management information system or for the record keeping of for the security the items needed for demand dependent like the input materials.

Material which is to be processed for producing the goods and services. So, in this connection only the word inventory is used. Inventory the word comes from the French word, which is called inventair and there is a similar kind of the Latin word also, which is inventarion. So, these inventory word has been taken from the French word as well as the Latin word French word is inventair and inventarion is for the Latin word.

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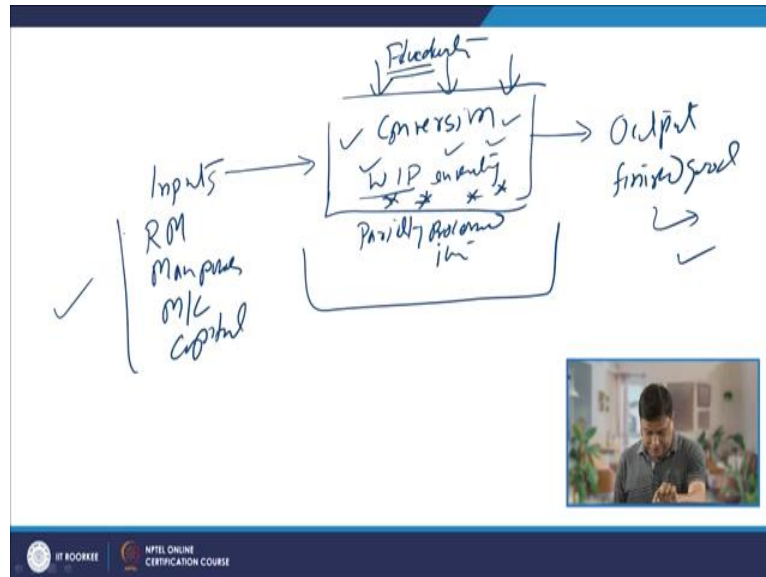


The typical meaning of the inventory means the keeping the things in stock keeping the items in stock and store keeping. So, here basically maintaining the record of items in store or the things which are being consumed. So, basically there is this record maybe in terms of the kind of the available stock or at any moment of time and the items which has been consumed.

If we know, so the both these things will be indicating the status of the inventory or status of the items, which are there in stock. And what are the items which are kept in inventory, there basically three types of the items one is like the raw material, the raw material means like the steel rods, flats plates, sheets, whatever is needed for production of the goods and services likewise wheat floors, sugar et cetera for the service industry.

Then there is another category of item where we have like semi-finished product or where we can say the partially processed items partially processed items. Here, so this is also termed as work in process inventory, work in process inventory. And then there is a third type of the items wherein we store the finished goods before dispatching it to the customers.

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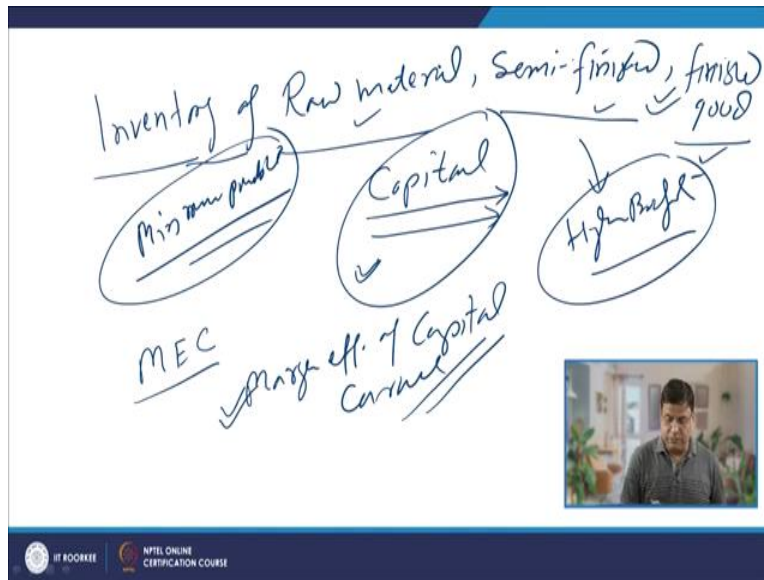
So, if we see this in in form of block diagram like input stage then the items at the input stage are fed in form of like say the raw material, manpower, machines, capital et cetera. And these then there will be a one conversion process where the use of these input items for transforming these into the useful goods.

But in course of the production there will be lot of things which will be in the different stages of production. So, that will be termed as work in process. Inventory items or like a the partially processed items will be kept in store at store means at the different stages of the processing. Once the materials or the things pass through this conversion stage there will be output.

Output will be there in form of the finished goods. Finished goods storage is needed for various purposes, like smoothening the production or sub or dealing with the fluctuation in demand when there is more demand this store of the finished goods can be used when the demand is less that store can be developed store or stock of the finished goods can be developed.

At the same time, this work in process inventory also deals with the fluctuations which are coming up in course of the conversion process. These fluctuations may be in form of like say machine breakdown, delay in or absent increased absence of the workers. So, there may be many factors which can affect the smooth flow of the material through the production processes. So, basically, this is the production stage. These output is stage and the input stage.

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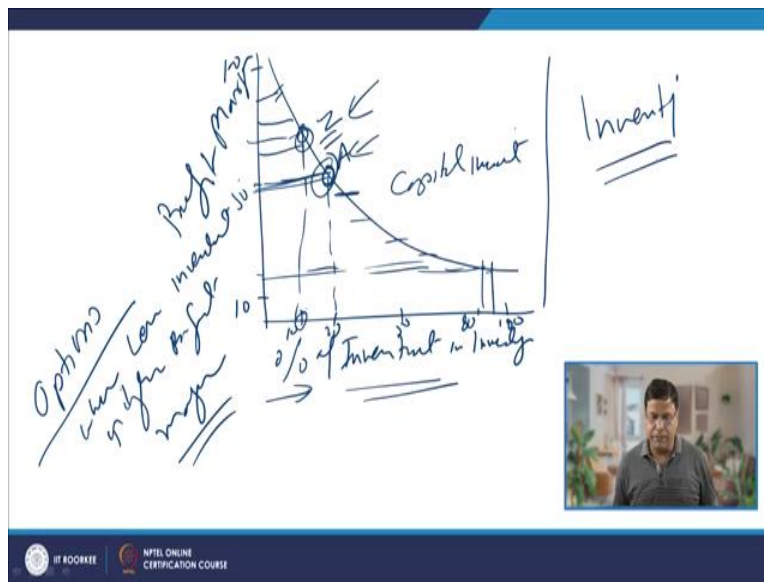
So, now we will see, whenever there is inventory, inventory of either the raw material or semi finished items during the manufacturing or the inventory of the finished goods in all these cases the material will be locked in or material will be blocked for certain time. Which means the capital mat capital in form of these raw materials, semi-finished material or finished goods will be blocked in form of capital.

The capital which could have been invested elsewhere for earning the profits. So, it is very important that we should block this capital only of that much amount which can give us the higher profit margins. So, to check if the amount being blocked or the capital being blocked is giving enough the profit margins are not for that one typical curve is used.

While at the same time it is efforts are always made to maintain the inventory at the minimum possible level, so that the production process is smooth the flow of items through the different stages is smooth. There is never a stock out situation and whenever there is a demand the organization is able to fulfil that.

So, it is crucial that the quantity of the items to be kept in a store is identified with the clarity and that has to be on the minimum possible side. So, that with the minimum possible capital investment on the inventory higher profit margins can be realized. And for this purpose, we use one diagram which is called MEC margin efficiency of capital curve. Means for a given investment of the capital. What is the kind of the profit which is realized?

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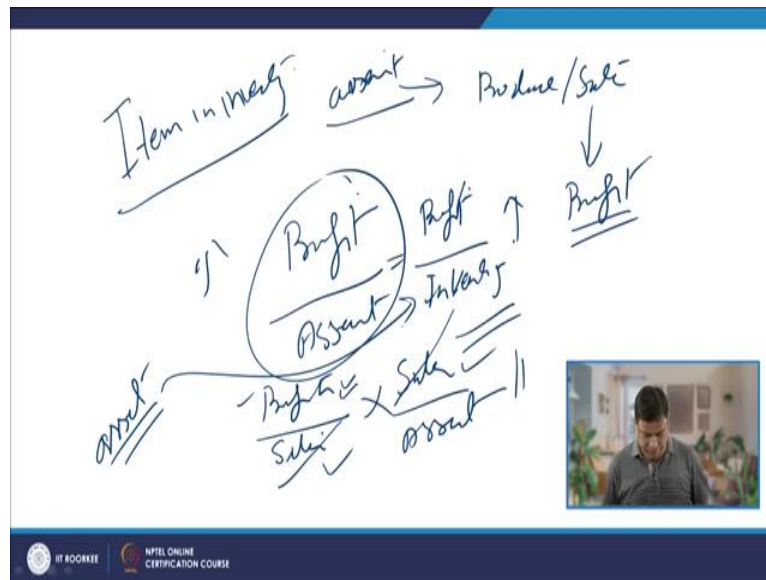
So for that, let us take like the percentage of investment in inventory and if it is related with the profit margins. Percentage like say 10, 50, 100, 10, 20, 50, 80 and 100. The percentage of the inventory the investment in the inventory. So, this curve comes out to be like this. So, here if the investment is just 10 percent of the investment of the inventory and giving us the profit very high profit margins. If the capital investment needed say this much, which we indicate in form of capital investment needed. Then say for there can be various options for investing the money which is available but instead of investing in those options, if it is invested in inventory

Then what kind of the returns can be obtain say, one of the option is this where capital investment as compared to the percentage of the investment in inventory is this one say this is one option, so investment is this where 20 percent of the investment in the inventory is invested in this option, then it will be giving the profit margin percentage of profit margin is this.

So, below this if the if we are going for the investment in the inventory where the investment is too high, but if the profit margins are low, then this will not be a good option to go for the investment in the inventory. So, those options we are investment is less and the profit margins are high efforts are made to choose those options option Z needing further lesser investment, but for the higher the profit margins, so those will be choosing so the options are alternatives rear less investment is giving the higher profit margins

That is what is identified. Sometimes investing too much may not giving may not be giving the high profit returns. So, what is the minimum required like in inventory how much we should invest so that the profit margins remain high. If investing less in inventory giving the higher profit margin, so that is what should be targeted.

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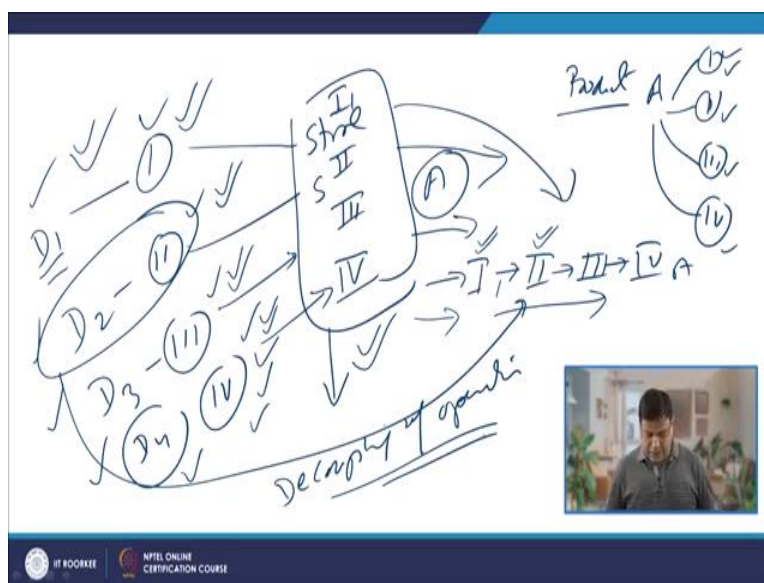
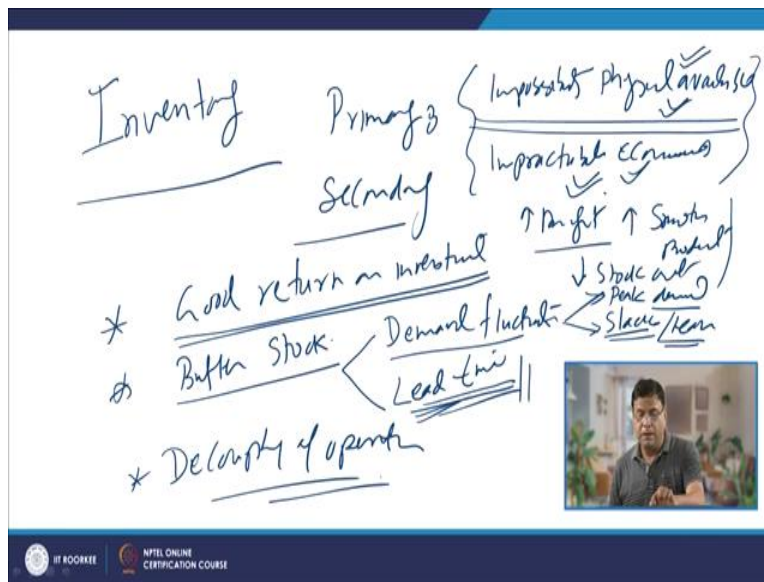


To understand this like say the items in inventory is like the asset that we have for those assets what we are able to produce and sale. So, whatever is produced and sold, what is the kind of the profit that is being realized. So, if we see here the profit divide by assets for given investment this asset is in form of like say the percentage of profit divided by the asset in form of the inventory. This should be high enough for taking the suitable decision.

So, if we see the profit is coming from the sale. So, for what is the amount of the profit and for given amount of the sale then what is the sale out of the given asset. So, if we see from the given assets will they will hire the assets higher will leave the sell, so for a given assets, what is the sale? And for a given sell. What is the profit? So, if you take this these two will be cancelled then profit to the asset ratio should be high.

So, if we see here, if the asset quantity is less for a given percentage of margin, then we should make the decision about the investment in inventory accordingly. Now, what is the need of blocking the money and then gaining the profit through the blocked money in form of the inventory and. How this is justified?

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So, the need of inventory, the primary need there are two types of the need, one we can say one is primary and others are secondary. The primary need comes from the likes say impossibility. Impossibility of making the things physically available whenever they are needed this is one. You see I need now so if it I do not know how it will be possible to get the things as and when they are needed. So impossibility of making the things available whenever they are needed and wherever they are needed and even if this is possible the impracticable economics.

The cost will be too high. So, the impossibility of making the items required physically as and when they are needed and wherever they are needed and the second even if it is possible, it will

not be practically economical means the cost will be too high. So, to deal with the situation of the requirement like whenever and wherever items are needed if we have them in store those can be made available and that to economically.

So, to deal with this problem of making the things available whenever and wherever they are needed and that to economically is the primary reason behind the maintaining the things in stock whatever is needed for smooth production of goods and services. Then there are various secondary needs or the benefits which are realized through the maintenance of the inventory

About one we have already talked like investment in the inventory really an appropriate inventory maintenance helps in having the good return on investment. So, investing little bit will give us more in terms of the increased profit margins is increased smooth production, reduced stock out situation. So, many benefits are realized through the maintenance of the inventory and that helps in getting the increased return on the investment.

Then there is a buffer stock inventory acts as a buffer stock. We know the inventory helps in a acts as a buffer stock to deal with the two difficult situations one is the demand fluctuation. So, whenever there is an increased demand the items can be taken from the inventory either in form of raw material or in form of finished products or whenever the items are so it so increase the demand can be dealt effectively with the help of buffer stock.

And whenever there is slack period or lean period then the stock can be piled up stock can be build up for dealing with the situation of the peak demand. So, it will help in maintaining the production smooth. So, the next one another aspect related with the so stock so the fluctuation in demand in peak demand situation stock can be used and when the demand is lean in that case the stock can be developed.

Another thing is lead time. It is practically very difficult to get the items received immediately on placement of the order. It always takes some time maybe 2 hours maybe 10 days. So, to deal with the fluctuating lead time possibilities, it is not necessary that always will get the delivery in 2 days or in 5 days.

So, to deal with the situation of the fluctuating lead time, the stock available stock also helps to smooth in the production or to fulfill the demand whenever there is fluctuating demand whenever it is there even when the lead time is fluctuation. So, it is like something is already there in stock

whenever demand is more it can be supplied or when we do not get that supply from the supplier. Then during the lead time the item in stock can be used for a smooth production or to supply the demand to the customers.

Then next one is the decoupling of operations. Decoupling of operations. This point is extremely important. Why because there company may be producing a product. A which needs various items like item 1, item 2, item 3 and item 4. And all these are items can be produced independently at different locations in different sections or the departments. So, if we use the inventory like the item 1 is coming from the D1 department, item 2 is coming from the D2 department and likewise D3 and D4.

So, each department can independently plan the production schedules the way by which these will be manufactured and finally the product A will be realized through the assembly line of the items 1, 2, 3, 4. So, if we are making the different products and all these are kept in store. Store, so store is common for D item 1, item 2, item 3 and item 4, store is common. So, whatever is being produced by the department 4 item 4 is being produced it will be stored here.

So, whether they are producing more or less they will be producing as independently as per their convenience and likewise for item 3 and item 2. So, each the production of each of these items is independent and it is independently control but all these are stored here. For assembly line all these may be used whenever they are needed. So, item 1 is used first then item 2 then item 3 and then item 4 to make the product complete, product A is completed.

But whenever these items for assembly line we can keep on feeding all these items from the store. So, the production of all these items independently is possible. They will kept in store and from the store these can be taken up for smooth production. If these are produced directly then the problem with any of the department can held up the production process say the problem with the department 2. So, item 2 will not be produced and if they are not if it is not being produced then it can lead to the, it can hold the production it can stop the production process.

So, here this is the case where it is not decoupled but in this case the production process is say coupled where A being 1 is being produced whenever it is needed 2 is being produced whenever it is needed. If there is a problem, then the production process will be stopped. So, if the

production of all these items is done, independently these are stored in a store and these are used whenever they are needed.

So, this way it will be decoupling the production process of all these items wherever they are being manufactured. So, these can be in the same department same company or in the different companies. So, this so inventory basically our keeping the things and is store helps in decoupling of operations in the different departments on different sections different divisions.

Now, I will summarize this presentation in this presentation there are many other secondary benefits those benefits I will be talking in the next presentation I will summarize this presentation in this presentation. Basically I have talked about what is the inventory and what is the need of maintaining the inventory and how it helps in earning the profits. Thank you for your attention.