**Principles of Industrial Engineering**
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**Lecture 31**
**Production Planning and Control:**
**MRP, Routing, Scheduling**

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 topic, under this we have talked about the various suspects. In this presentation, we will be taking up the material requirement planning, routing and scheduling. So we will be starting with the MRP or which is also termed as material requirement planning.

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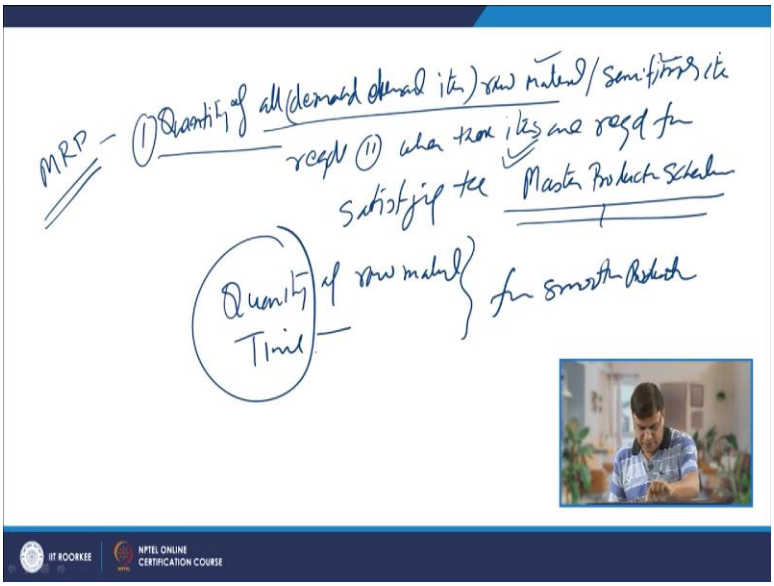


So in material requirement planning, basically we try to identify the quantity, quantity of all demand dependent items. It is basically, all raw material or semi-finished items, so required. This is one and when these items or input material are required for satisfying the master master production schedule.

In master production schedule, we identify the entire required entire quantity of the item to be manufactured to satisfy the demand. So in light of that quantity, whatever input materials or demand dependent items required in form of raw material or semi-finished product or when these items are required, so basically we identify the quantity of the raw material or the items needed and the time when these materials are needed for smooth production. So that the master

production schedule requirement can be satisfied. So this is what is material requirement planning identifies the quantity as well as the time when these items are needed to satisfy the requirement of the master production schedule.

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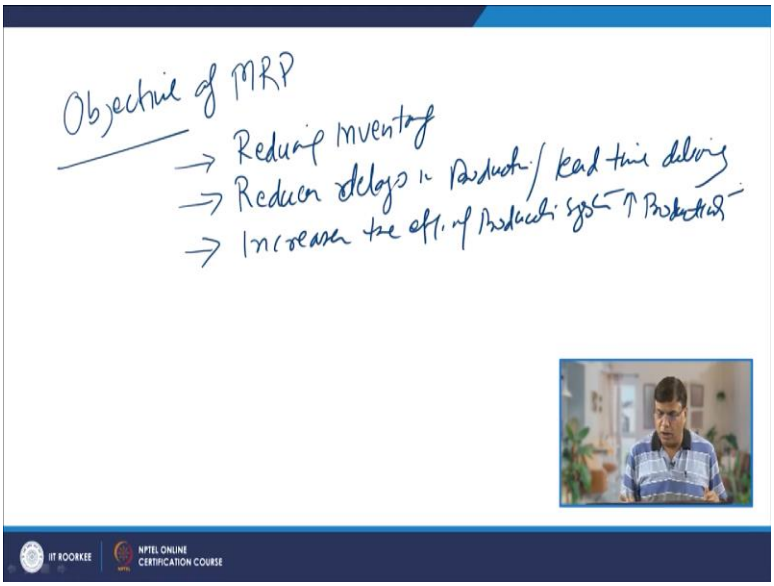


What are the objectives which are satisfied when the MRP is done, like objectives of MRP. There are three big objectives which are realized through MRP, one is it helps in reducing the inventory, second it reduces the delays in production/reduces the lead time delivery or lead time related with the deliveries of the item to the customers. Further, it increases the efficiency of the production system as a whole, which means it in helps to increase the productivity, so how these things are realized?

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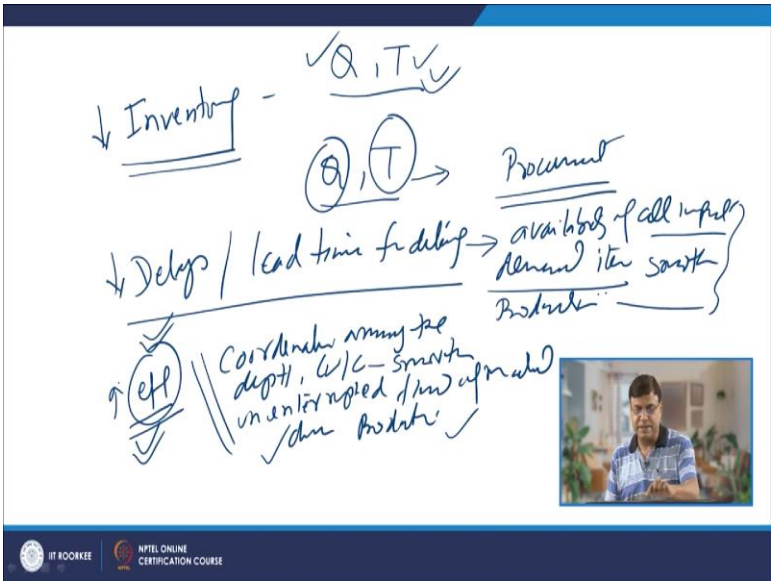


So we will take up the first point, like reducing the inventory. As I have said MRP helps in identifying the quantity of the items and the time when these items are needed.

So if we are able to identify what is the quantity which is needed and when these items are needed, then we can suitably make the arrangements for procurement. At that time so that the items are available for smooth flow of production. And this intern help will help in reducing the kind of item that need to be stored or it will avoid the piling up of the items in the store. Which means will whenever there is a requirement, items will be arranged through the procurement process in required quantity at the required time items are arranged.

So this intern will help in reducing the inventory, so basically whenever whatever items is needed, arrangements are made for the procurements so that it is not required to keep much of those items in inventory and that intern will help in reducing the inventory. The second is it reduces the delays or it reduces the lead time for deliveries, how it happens?

Like since we have identified the kind of item quantity of items and the when these items are needed and we are making them available. So, this intern will be leading to the availability of the all input demand items or items needed for smooth production. So the production will be going on smoothly and that will avoid any king of delay due to the lack of material.

Third is it increase the efficiency of the production system as a whole, which means since MRP, the in MRP basically the coordination among the departments, work centres helps in smooth

uninterrupted flow, uninterrupted flow of the material during the production. And when it happens we find that the output of the production system is enhanced and that intern helps in increasing the efficiency of the production system. So these are the three benefits which are realized. So perhaps in reducing the delays, having the smooth flow of the material through the production lines. And these two factors interns will be helping in increasing the efficiency of the production system.

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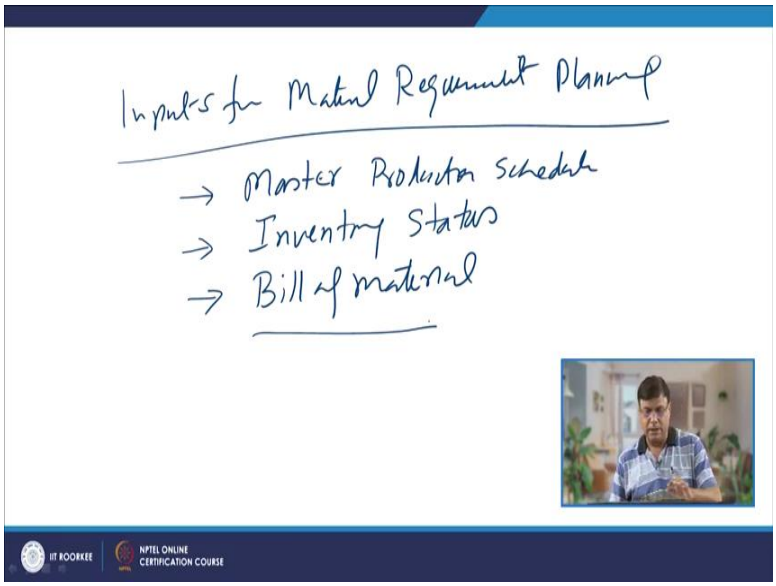


So what we do to identify the quantity of item quantity of items needed and when these are these items are needed to have the smooth production. And satisfy the requirement of the master production schedule. So what are the inputs used inputs for the material requirement planning? Material requirement planning takes the inputs from the three sources, one is what are the items to be produced?

So master production schedule this is one, then second what are items which are available in hand? So the inventory status and third the bill of material, means what are the different materials needed in which sequence they are needed what are the different operations to be performed. So based on the product designed these things are identified under the bill of material. So we will be taking up these points one by one.

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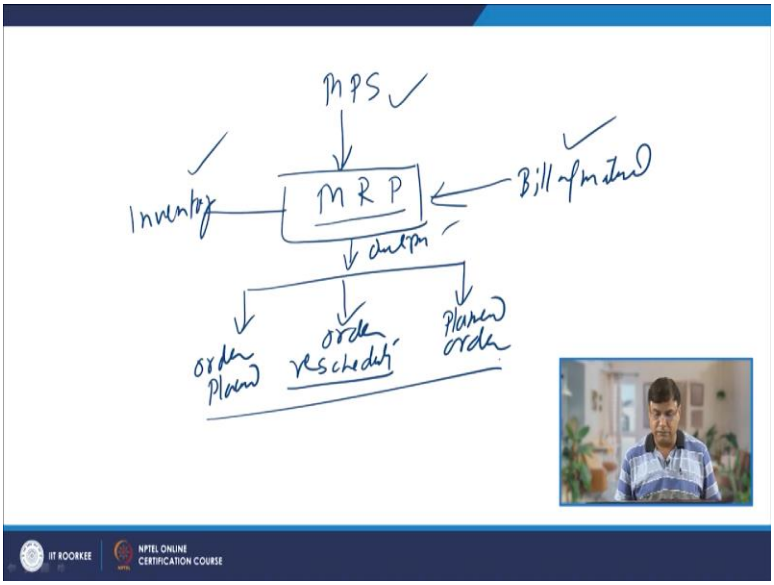


If you want to understand in block diagram wise, so material requirement planning is done by taking the inputs from three sides, master production schedule, inventory and bill of material and based in this, the material requirement planning is done which helps in determining which helps in determining what orders are to be placed, means the orders placed orders to be reschedule in light of the requirements, so rescheduling of the orders order to be placed immediately or the planed orders, means orders which will be placed in future.

Now what is it is done through the computer programs, where inputs will be given through these in these forms and that will be giving the output in form of the kind of the orders to be placed immediately or these are to be rescheduled or when these will be placed in future. So this is the kind of the block diagram which exist related to the MRP.

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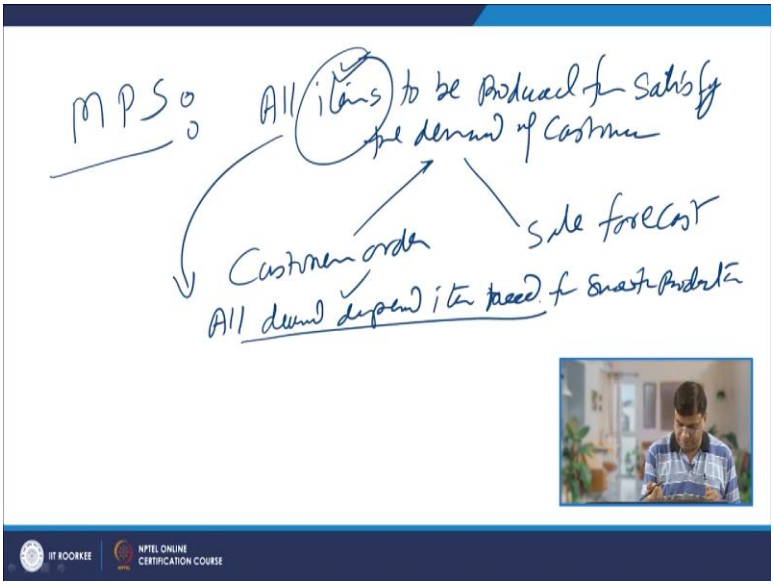


So what we get from the master production schedule, master production schedule is all about the all items or the quantity of items to be produced for satisfying the demand of customers. Now, so at the end we need all those items to be produced so that the demand of the customers is satisfied and for this inputs can be taken from two sources. One can be based on the customers orders, customers orders and the second is the expected the demand that is sale forecast.

So based on these two inputs, the quantity of items to be produced so that the demand in future can be satisfied for the master production schedule. Based on these inputs we identify the different items to be produced and that intern will be dictating all demand dependent items needed for smooth production. So here, the whatever items are to be produced that will be dictating the kind of the input material to be used for smooth production so that the items can be produced by the due date or the required target time.

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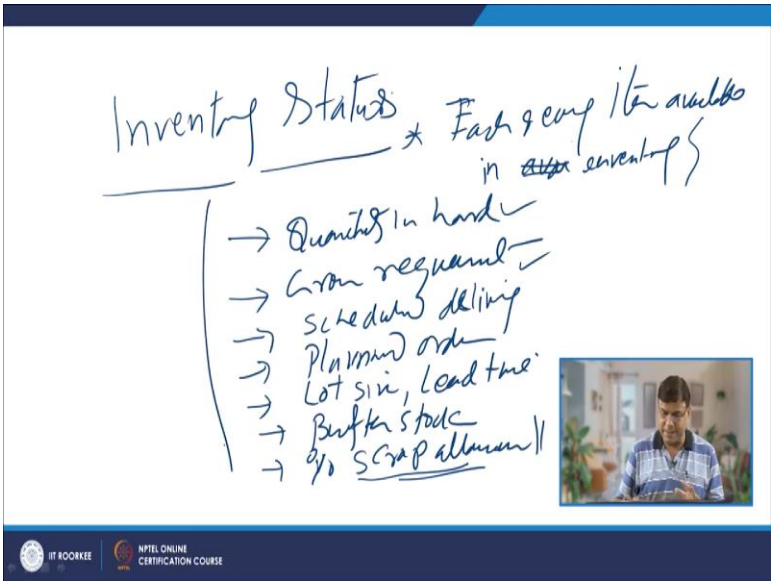


The second is the inventory, so inventory status is extremely important and which will be indicating what are the items available, each and every item available in inventory that status is determined in terms of the quantity in hand, how much what is the quantity that is already available and to satisfy the MRP requirement or the material requirement planning what is the gross requirement. And then we need to know, so if it is in deficit or what we are going to get in future what are the orders placed? What is the lead time? So those are details we need to know to see whether the items are available or we need to make the arrangements for them.

So inputs in MRP are also taken from the inventory status in form of quantity in hand, the gross requirement of the different items which are required for facilitating the smooth production. And then what is the scheduled deliveries for already placed items. Then what are the planned orders? What are the orders which will be planned for arranging the items?

Apart from this, what will be the quantity that will be received against the each order, so that is about the lot size and what will be the lead time for the delivery of the items. And then what will be the what is the buffer stock? And what is the percentage of the scrape or that we can say scrape allowance? Whatever quantities being supplied or available of some of the items may be useless or may not be fit for use, so what is that percentage scrape allowance, so these the information on these different heads is used in MRP.

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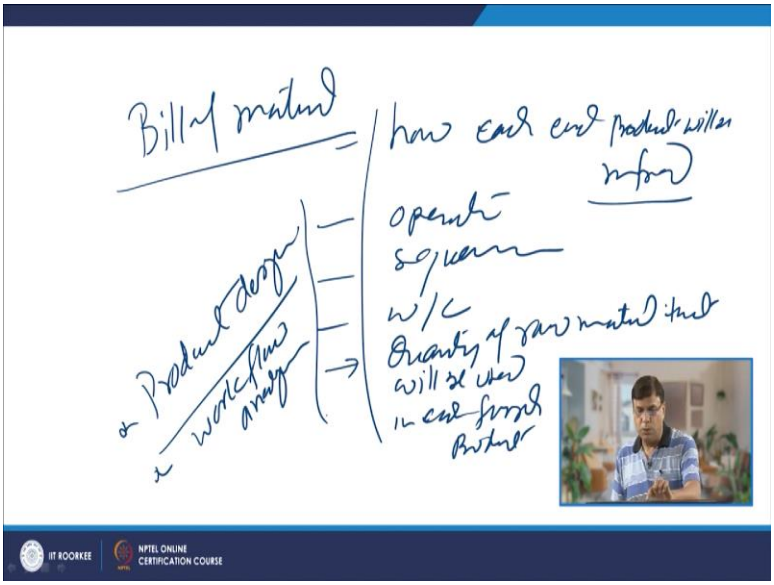


And then we have the bill of material. Bill of material basically it indicates how each end product will be manufactured this is one. And what are the different operations that will be carried out in what sequence, these will be carried out, what will be the works centres where these operations will be carried out? And what is the quantity, quantity of the raw material that will be used that will be used in each finished product.

So these information are basically extracted from the certain sources like based on the product design will be identified where what operations will be carried out, what material that will be needed. Then work flow analysis will give us the sequence of operations. So these as a things can be used to gather information about the bill of a material.

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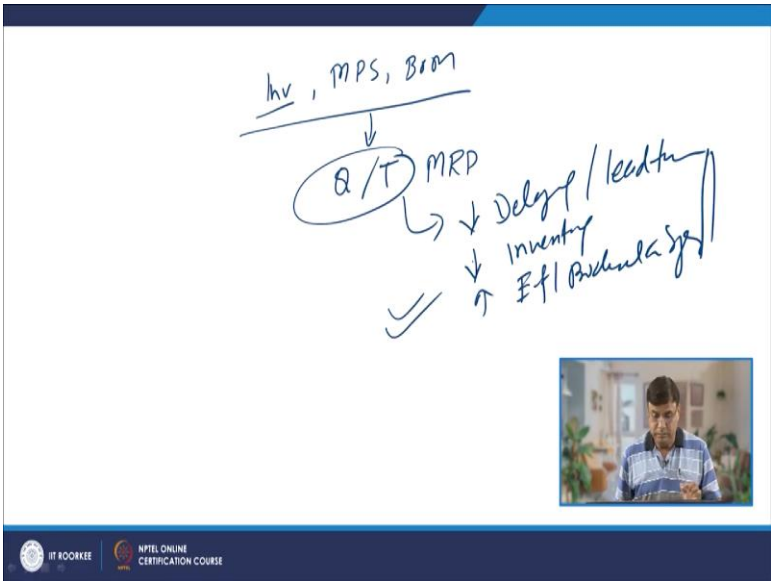


So what we have seen? That the inventory, master production schedule and the bill of material. These three things help in identifying the quality of items and that time when these items are required for the MRP that is the material requirement planning. And it helps in big way to reduce the it in a reducing the delays in reducing the lead times for deliveries, in reducing the inventory level or the capital held up the inventory. And it helps in increasing the efficiency of the production system as a whole. So it is production system as a whole, so it is good that MRP contributes significantly in the production system.

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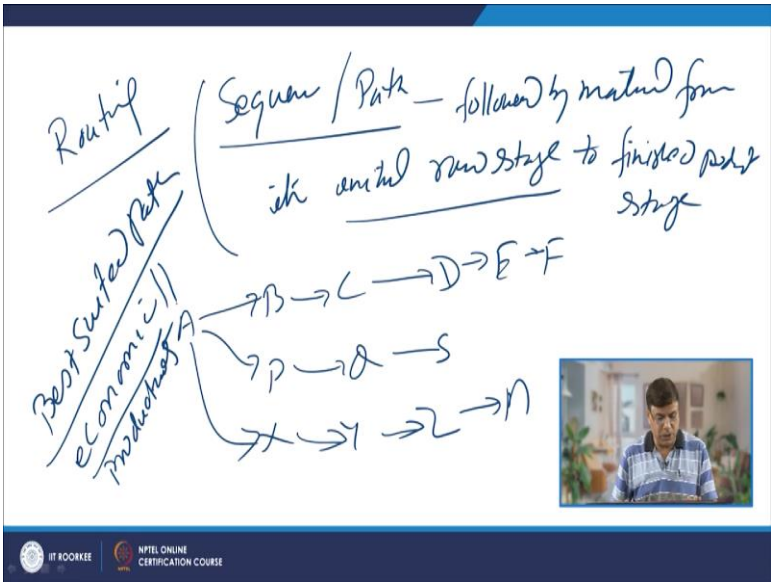

Another point is routing. Routing is about the sequence or the path that material will follow in course of production from its initial raw stage to the final finished product stage. So the path followed by material from its initial raw stage to the final finished product stage. In this course the raw material will be processing will be moving can be moved through the different paths. So in routing we tried to identify there can be the different roots like a A, B, C, D, E, F these are the five and then like say P, Q, R, S this is the another.

So there is one root is this, another root for manufacture can be this and there can be another one where X, Y, Z and say M. So this is the say third root, so if they have three possible paths which can be used for the production of a particular item, out of these paths it is the, it is very important to see the best suited path or the sequence is identified, so that our production is realized in most economic way. And in most productive manner, means the productivity is enhanced and the production is realized economically.

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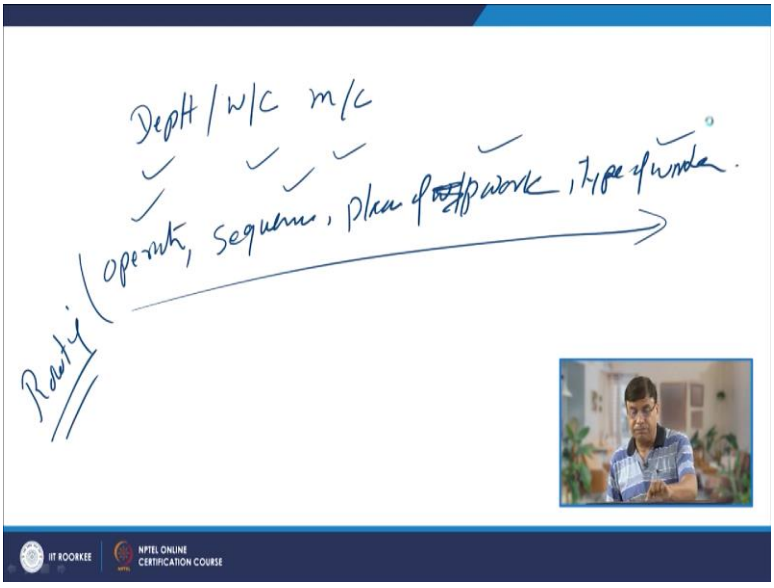


So basically in routing we have to identify the most efficient and effective path which will be followed by the raw material in course of its production up to the final finished stage, so that, it can be manufactured in a minimum possible time and in most economic manner. So that it can be made available to the customers at the low cost. So that is the main goal, so it will be identifying the kind of the work centres the kind of the machines or the departments or sections through which the material will be moved in course of the production under the routing. So basically the

department work centres the machines are identified for identified through which the material will be passed in course of its production. So in this process will be identifying the different operations to be performed, the different the sequence that will be followed.

The place of work place of work means where the work will be done the type of workers will be facilitating the work. So these are the information which are which are used or identified in routing. So apart from identification of the most efficient and effective and productive path for the production, it helps it also gives the information about the different operations, sequence the place where and the worker will be doing the work.

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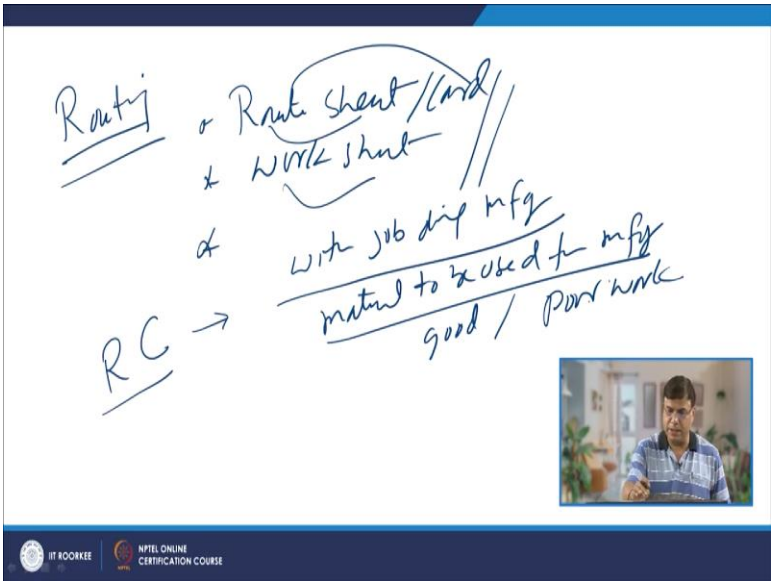


So what are the techniques or the methods of the routing? Basically there are three methods which are used for the for giving the information about the routing, one is the route sheet. This is route sheet or the route card, then there is a work sheet and then it also uses the worksheet and then route sheets. So route card, route sheet and the work sheet these are three things, three methods which are used to indicate the routing efficiently.

So as far as the route card is concerned, it indicates the kind of it is card which will be their with the job in course of its production. So the card with job during manufacturing giving the information about the material to be used for manufacturing of this particular item. And the other information that can be included here is what is the kind of work which was done good or other kind of the poor work or the scrap was generated.

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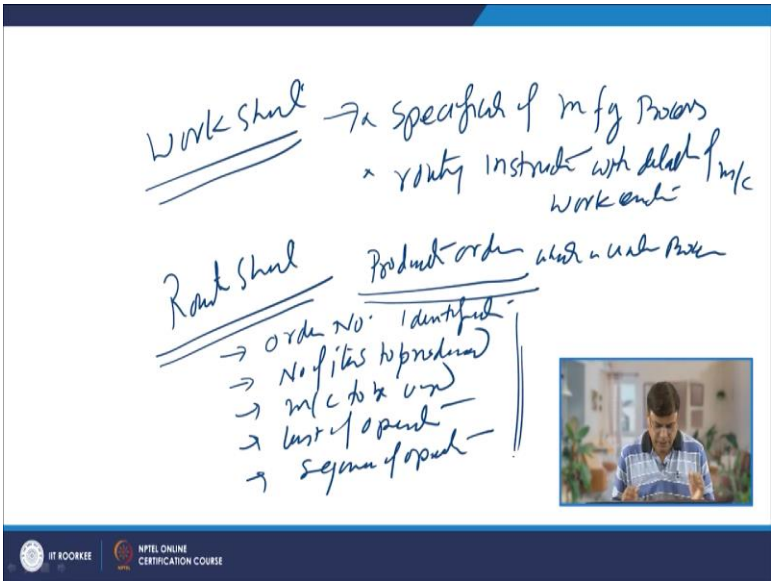


Then there is the work sheet, the use of the work sheet in routing gives the information about the specifications of the manufacturing processes to be used. Like what process parameter what process what process parameters? What kind of conditions that will be used to give the desire size and shape or properties to the product which has been manufactured.

So specification of the manufacturing process is, one, also gives the routing instructions with the details on machine on which works will be done. And the work centre where work will be done. So this is the another information which is given with the worksheet. And then there is route sheet, so route sheet gives the lot of information about the kind of the production order which is under process.

So route sheet is for the specific production order which is being processed to give the desired output with the due date or the time when it is to be completed. So it gives the information about the order number which is process, so order number identification this is one. Then, the number of items to be produced and then there is the machine to be used for operations. List of all operations to be performed and then what will be the sequence of operations that will be done in course of the production.

So these are the things which are given in the route sheet, so under the routing basically it is about the identification of the most efficient, effective, productive and economical path for the flow of the material from its raw stage to the final finished stage, so that it can be produced

economically in the minimum possible time and this is done through the proper analysis of the different paths which can be possible.

And once it is finalized, then information is given in form of like say the route sheet, work sheet or the route card. Now, I will summarize this presentation, in this presentation basically I talked about the material requirement planning, what are the objectives and what the inputs which are used for the material requirement planning and what are the advantages of the routing and how the routing information is given. Thank you for your attention.