Operations Management
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Lecture – 56
Just in Time (JIT)

[FL] Friends welcome to session 56 in our course on Operations Management. Currently we have discussed the materials management in the previous week and now our focus will primarily be on the advanced topics that are used, or the advanced techniques that are used for operations management. First one of them is just in time usually which is called as JIT, we will discuss what is JIT. What are the various functions of JIT? Where it is applied? We will try to understand JIT with the help of a very simple case study, and try to see the advantages and drawbacks of JIT.

In the last week our focus primarily will be on the topics which are the current interest area in the manufacturing sector, in the operations management. We will see today we are going to start with JIT. In the next week sorry in the next session our focus will be on Kanban system. Then we will focus on materials requirement planning may be two sessions will be required to cover the MRP and finally, we will move toward the enterprise resource planning that is ERP.

So we are now at the fag end of our course and we have covered almost all topics that are related to managing the operations in an organisation. Starting from product design and development to sales forecasting, then the selection of a facility planning or selection of a location for establishing a factory, then the layout designing, then we have covered the aspect of production control. We have seen the project management concept with help of CPM and PERT.

Then we have seen project scheduling, we have covered materials management, then we have covered in the 11th week the various may be formulas, numericals that can be used while managing our materials in the organisation. Now, we will see in this particular week that how materials can be managed in a more efficient and effective manner with the help of a centralized system that we call as the materials requirement planning system. How it works? What are the inputs for MRP system? What are the outputs of a MRP system? And what is a ERP system? How it can manage the all the different

functional domains of an organisation such as finance, such as marketing, such as sales, all as well as the manufacturing materials management everything incorporated into a one centralized management system, so that will be the last session of this week.

So, today we are going to start finally, the discussion for the last week of our course that is Operations Management. And today we are going to study about JIT; just in time. Basically the JIT concept is focussed on making use of our resources in the most efficient and effective manner, minimising the wasteful expenditure, minimising the wasteful usage of materials, minimising the time, making and taking advantage of the lead times that are there for the supplies. So, overall focus will be on making best possible utilization of the resources that are available at our disposal. So, let us try to understand what JIT is all about, and how it can help the organisations to take advantage of this concept.

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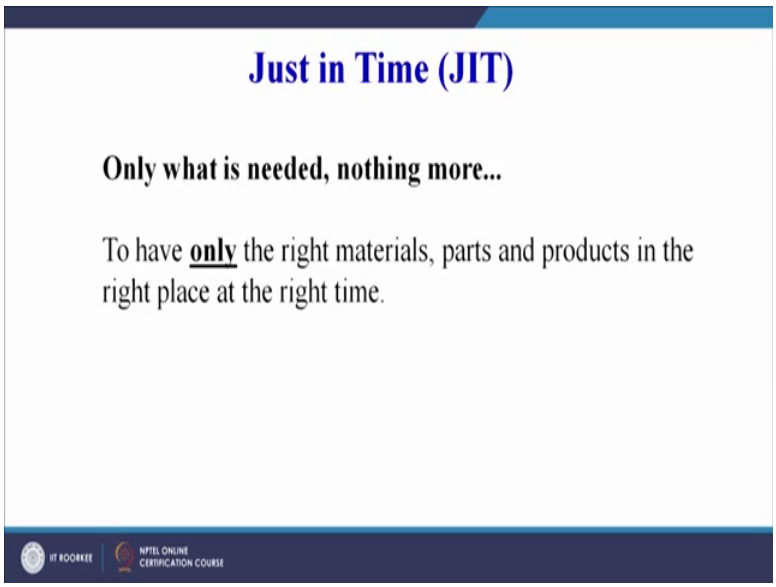

So, just stay in time as you can see on your screen. Focus is that only what is needed, nothing more. So, whatever is exactly required that must only be considered may be everything else which is a wasteful in terms of expenditure or time or material or manpower must be avoided. To have only the right materials parts and products in the right place at the right time.

So, only has been highlighted here why? Because we have to focus on the right materials; which means the wrong materials should not be there, right parts, right

products. So, whatever materials are required only those should be focused upon; whatever is not required may not be considered at all. Then the second is at right place; wherever they are required these materials must be available at that place and at the right time.

So, I think three important questions are there: What? Where? And when? So, JIT tries to answer it that what exactly is required, where it is required and at what time it is required. So, may be that these three questions that what is required? Where it is required? When it is required? Sorry I think I have said what as the last question. So, three questions are there again I will reiterate or maybe I will again emphasize on the three question that what is required that is what is the right material that is required, where it is required, what is the location, where the material is required. And when it is required that is the time domain that at what particular time the material is required.

So, we will also try to understand this with the help of materials requirement planning in our subsequent discussion where we will see that once we know that the product has to be delivered by a particular date, how do we offset the other operations as well as the material procurement process, so that we are able to meet the deadline. So, here also JIT will focus on the three aspects that what are the materials required they must be available with us, where they are required at which particular section of the organisation they are required and when they are required.

So, all this has to be optimized and if we are able to optimize these three things that what is required, where it is required and when it is required? Our overall production process will become optimized and we will be able to be set good standards of productivity. We will be able to efficiently and effectively manage our operations with high degree of productivity.

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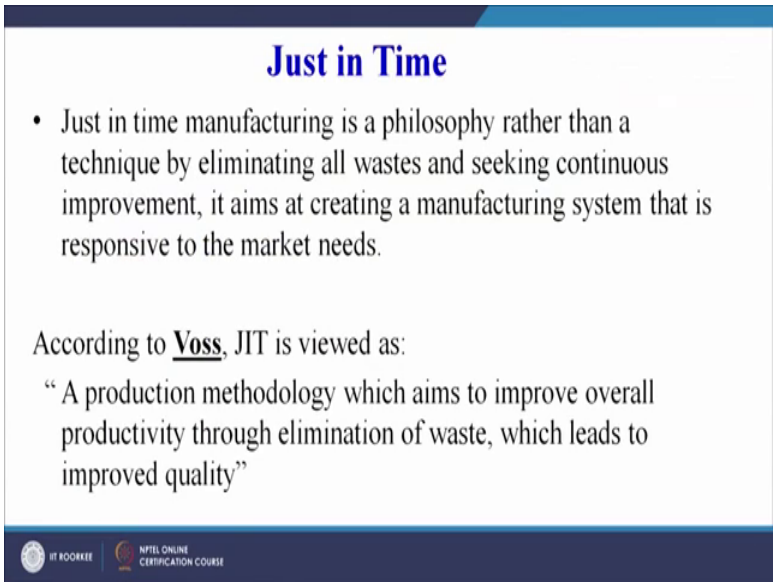

So, just in time manufacturing is a philosophy rather than a technique by eliminating all waste and seeking continuous improvement, it aims at creating a manufacturing system that is responsive to the market needs. So, we can see that here our focus will be the elimination of all waste and all always seeking continuous improvement, always looking at areas where we can improve, where we can minimize the waste, waste may be in terms of time, it can be in terms of resources, and it aims at creating a manufacturing system that is responsive to the market need.

So, whatever is the demand in the market our manufacturing system must be responsive to the to that needs. As and when there is a demand our system must respond in the most efficient and effective manner and whatever is required in the market we must be able to satisfy that demand, we must be able to tap that demand, we must be able take advantage of that demand, so that we earn profit for our organisation.

And JIT is one such philosophy which will help us in making our system responsive to the customer demand. So, according to Voss, JIT is viewed as: "A production methodology which aims to improve overall productivity through elimination of waste, which leads to improved quality" So, three important words are overall quality has to be improved. How it can be improved by elimination of waste that is second important point and then if you are your productivity is good, your waste is less; your quality will automatically be high. So, all these three things productivity will improve, waste will

reduce and quality will be high. This we will focus when we will see the advantages of applying the JIT philosophy in the operations management system.

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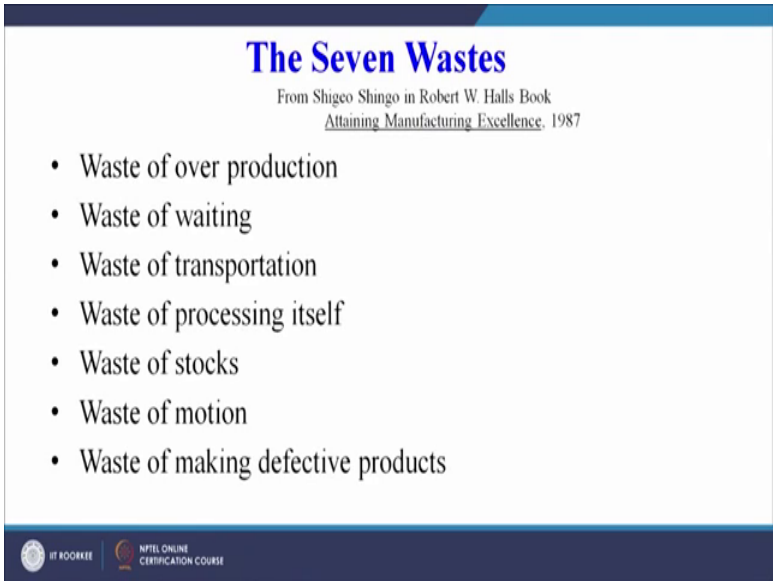

Then the seven wastes this has been adopted from Attaining Manufacturing Excellence, This is Robert W. Halls Book, so the seven wastes that can be focussed on are the waste of over production. As we have seen as per the definition of JIT, we must be responsive to the demand, so it means that we can avoid the waste of over production. If we are responsive we know as soon as the demand will be generated or it is created in the market we will be able to respond to that demand, so need not go for over production.

So, we can avoid the waste of over production, waste of waiting is provide is must be avoided using the JIT philosophy, waste of transportation, waste of processing itself, waste of stocks, waste of motion, waste of making defective products. So, as we have seen that if we apply the JIT philosophy, we are able to eliminate a lot of waste, some of the types of waste are listed on this slide.

So, it is difficult to explain each and every waste with the help of an example, but I will advise all the learners, all the readers or all the audience that you can focus on certain case studies. We will also try to see one case study here where we will try to eliminate some of these waste in order to improve the overall productivity of the operating may be of the operating system or of the operations. So, we will that some of the waste like

waste of transportation. There may be some unnecessary movement of the material within the organisation because of a specific layout that we are using in the organisation.

So, if we modify the layout the waste of transportation can be reduced. Similarly waste of motion there can be a person who has to move unnecessarily in the on the factory or on the shop floor in order to fetch certain materials. This is because the tool grip is at a distance from the place where he is working. So, the system can be redesigned in such a way that tool grip is integrated with his operation station or with his station, so that the unnecessary motion of this worker is avoided because that is a wasteful motion of that worker which can be avoided. So, JIT will focus on systems where we will try to avoid all these types of wastes.

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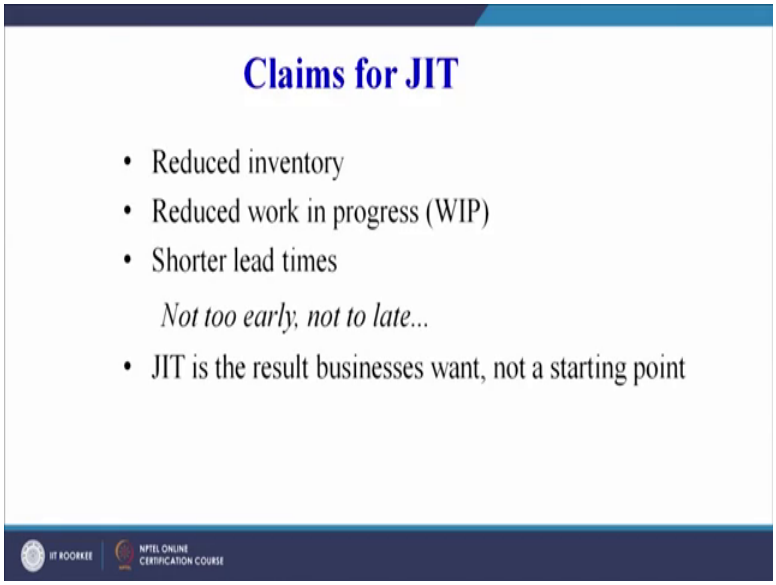

Now, claims from JIT. If we apply the just in time philosophy what can be achieved? So it claims to reduce the inventory, reduce the work in process if you remember we have seen how inventory is defined or what all materials fall under the classification of inventory. In our previous week where we have seen materials management, we have seen what is WIP? So, reduced inventory, reduced WIP, shorter lead times, not too early not too late. So, whatever material is ordered it is ordered in such a way that it arise at our premises, or at our location just in time that is when it is required. It is not going to happen that we order the material and store lot of material in the inventory.

So, it is not too early and not too late. If it is late then our production process may stop which is one of the drawbacks of JIT. If it is too early we may have to pay for the carrying cost of that inventory or the product that we or the part or component that we have received too early when it was required. Suppose it is required on 30th September, and we have received it on 30th of June. So, the July, August, September; 3 months carrying cost we have to pay for that material. So, whatever material we are maybe procuring must arrive just in time may be when it is going to be used not too early as well as not too late.

So, JIT is a result businesses want, not a starting point. So, we want to may be achieve such a system where the things are managed in the most efficient, effective and productive manner where there is no wastage in terms of materials, time, motion transportation, human work or man hours. So, all kinds of wastage is avoided. So, there that is the way you can say the system that we want to create with all such philosophical concept.

Similarly, there is a concept of lean manufacturing also; where we focus on making our system thin and lean, shedding all the excess baggage that the system is getting in terms of waste. So that is also similar concept where our focus is to eliminate the waste, to make our system lean, to make our system agile, to make our system more responsive to the customer need. But here the focus as is lean manufacturing is to ensure that our process is smooth things are wherever they are required they are available at that time there is no weightage, there is no stoppages, so all that is the overall objective of our JIT philosophy.

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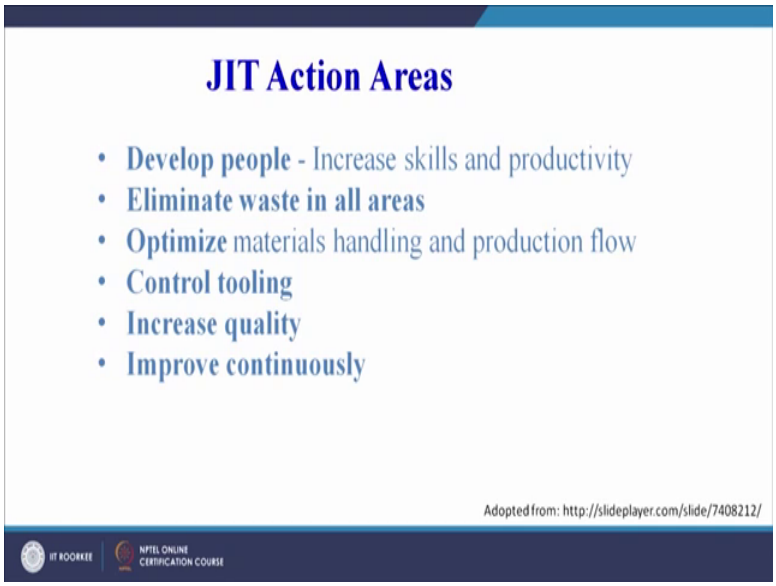

Now, JIT action areas let us see develop people; we need to increase the skills and productivity of our work force. Eliminate waste in all areas, optimize materials handling and production flow, control the tooling, increase the quality, improving continuously. So, we can see that we can focus on all our resources. You see we are focussing on people, we are focussing on all types of waste that are that is there in the system.

We are focussing on material handling and production flow. Our focus is again on tools. So, if we are able to focus on all these states or all these important components of the manufacturing system, we are definitely going to improve the quality of our product as well as we have to focus that whatever quality we are producing today, we have to continuously improve that quality, continuously improve the way we are doing the work, the way our operations are being done in the organisation, so that we are able to find the exact combination of man material machine equipment which will deliver the best product which will have the company to earn profit in the long run. So, we action areas are materials we need to focus, material handling we need to focus, people we need to focus, quality we need to focus, time we need to focus. So, if we focus on all these actionable areas we are definitely going to benefit by applying this concept.

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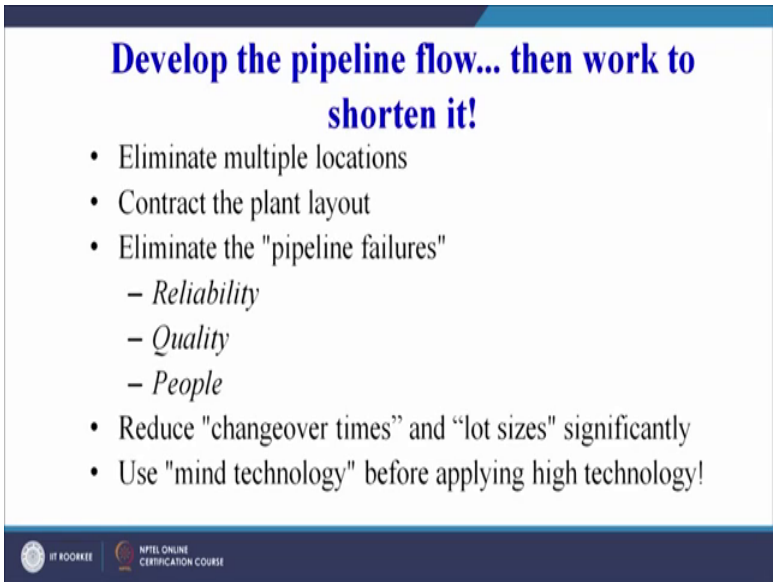

So, develop the pipeline flow the work to shorten it. Eliminate multiple locations, contract the plant layout, eliminate the pipeline failures, reliability, quality, and people are the focus areas here. Reduce the changeover times and lot sizes significantly, use mind technology before applying the high technology. So, we can see that we have to go step by step by step.

So, we have to focus on plant layout also, we have to see as I have told you in one case a person has to move from one place to another place to fetch his tools and this he may have to do 100 times in a day. So, if we can eliminate these two multiple locations, and combine the work station and the tool crib in such a way that this unnecessary motion is avoided that is also falling under the JIT concept. So, plant layout we will try to understand, we will try to see that how the change in the plant layout can help us achieve better production flow

So, we have to see that what is the reliability of our system? What is the quality? What is the what are the skill set of the people? How we can improve our work force in order to match the requirements that are there for the production? So, we have to see the changeover times may be when the product is changing or the there is a product design change; changeover time must be minimum.

For example, we see that flexible machines are being used these days which can adapt to the product changes very quickly. CNC machines are being used where you only need to

change the program as required by the product design change and you need not focus on changing the machine itself which was the case may be some 50 years ago. So, today we have a program which is written for a specific product. For example, we can say this pointer is being manufactured, this is being machined suppose, although it is a plastic part suppose it is being moulded.

Now there is a change in the shape of the pointer, we only need to change the design, we only need to change the drawing, we need to change the tool part, and accordingly a new program will be created and which can be used for manufacture, the changeover time has to be minimum. And similarly that is one point with respect to the product design change.

Other thing can be suppose we are working we are using a particular type of fixture, we need to change the size of the product that we have to machine. What we need to do? We need to changeover from that particular product to another product that time must be minimized. So, we can go for fixturing arrangements which are auto clamping type, we can the fixtures to universal type of fixture which can be used for clamping varied type of products, so, that our time that goes in to the changeover is minimum.

And if you remember the concept of group technology the focus is on this set up and put away time only. Our focus must be that actual machining time should be maximum and this setting up time and putting away time should be minimum. So, this time optimization is also a focus that we must, may be understand in context of the JIT. So, the lot size is also may be reduced. In most important thing is that we have to use our common sense that where wasteful things are happening or where is the waste and how it can be eliminated before we apply the high end technology in to the production system.

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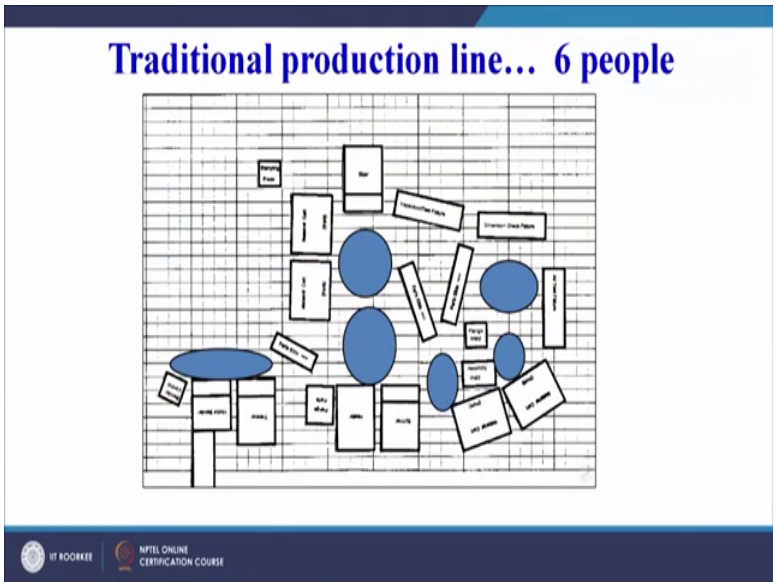

Now, this is you can see traditional production line, 6 people are working here, these are all the work stations, the square and the rectangular boxes represent the work station. And this blue circles and ellipses they represent the people or the working area of a particular person. So, if we count these blue circles or ellipses we can see 1, 2, 3, 4, 5, and 6. So, 6 people are managing this total production line. So, the layout, you can see slightly cluttered type of layout. How we can improve this?

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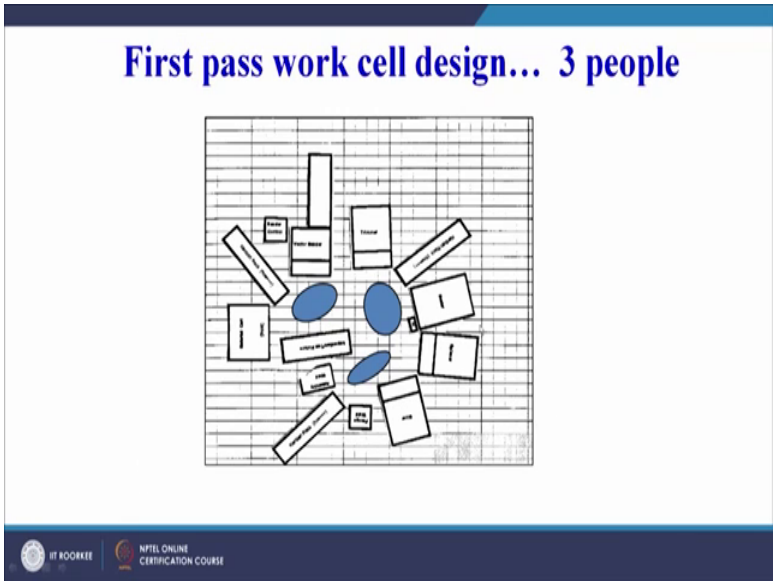

First pass work cell design. So, different cells have been created and one person has been made in charge of a particular cell. So, now the same work is being done only by 3 people by the concept of work cell design.

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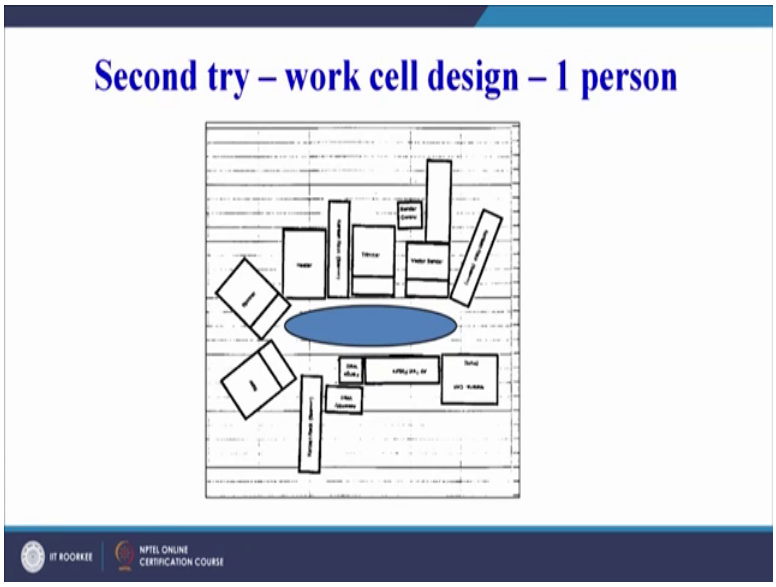

Finally, we can see second try work cell design, we have arranged the machines in a particular order and a single person can also operate these machines. So, the basic idea to emphasize here is that if we see the application areas of JIT, it was that we can improve the productivity of our employees; we can improve the skill set of our employee. So, here we can see instead of 6 people managing a cluttered work space, one person can manage a better organised work space. We can improve the skill sets of that person; we can give him adequate bonus, adequate salary, adequate hike in his package.

But he will be able to manage the whole production line singlehandedly; which means that we have been now able to organize our production in such a way that man hours relating to 5 people have been saved which was a kind of a waste because of the system in which we have planned our layout. So, a re-layout or may be a modification in the layout has helped us to eliminate the extra work force that was employed because we were not able to manage our production flow line in the efficient and effective manner.

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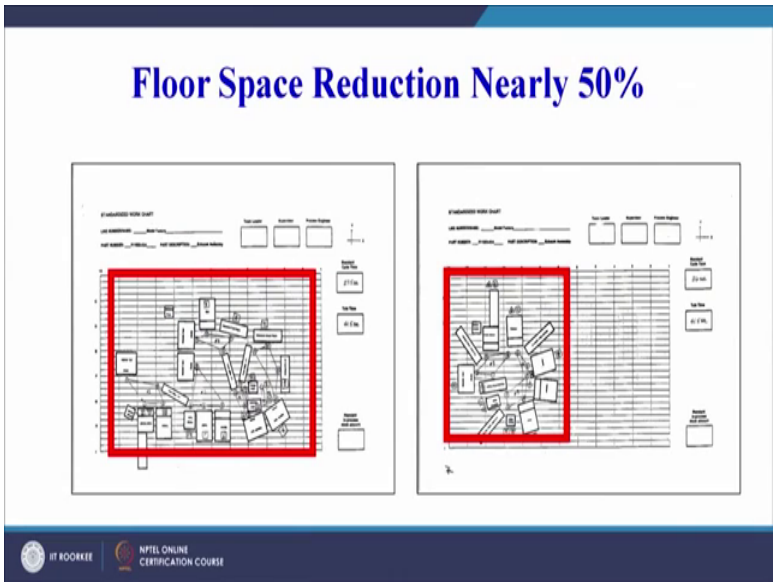

Another advantage you can see floor space reduction that is also nearly 60 percent. So earlier you can see this is the earlier layout and this is the modified layout where 50 percent space can also be saved. So, the space wastage has been saved, the motion wastage of the different employees has been saved and the number of employees have been reduced. So, overall our system has become more productive, more efficient and more effective.

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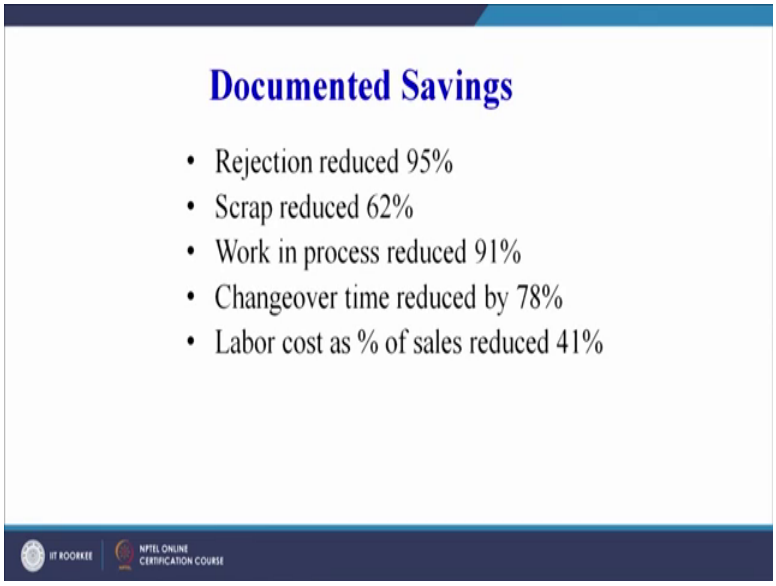

So, this is a documented savings as per the case we have taken. The reduction was reduced by 95 percent, scrap was reduced by 62 percent, work in process was reduced by 91 percent, changeover time was reduced by 78 percent, and labor cost as percentage sales reduced by 41 percent. So, you can see that these are the savings that have been done.

So, labor was saved changeover time got reduced, work in process got reduced, scrap was reduced, rejection was reduced, which mean the overall quality of the product also improved. And if the quality is improving the customer will be more satisfied and brand name of the company will also be higher in the eyes of the customer. So, we can see that simple modifications can help us to manage our operations in a better manner.

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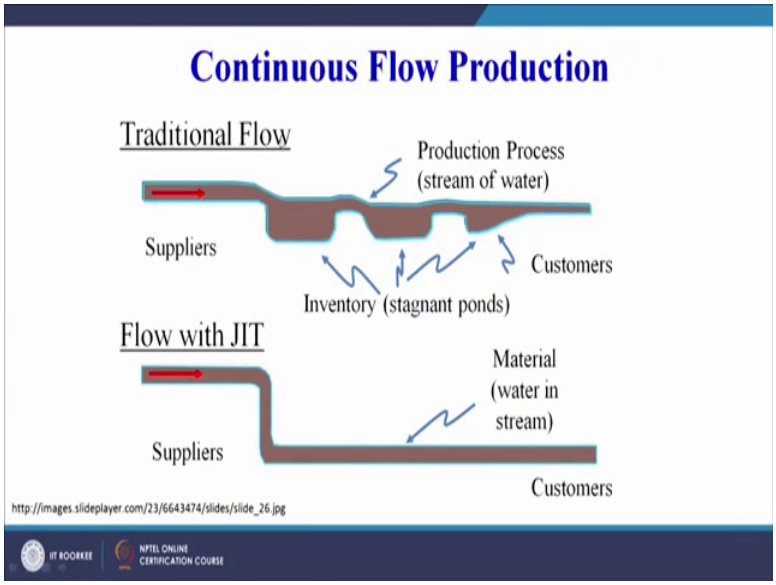

Now this is a simple way of continuous flow production, this is being depicted by the water stream of water. So, this is supplier and this is our traditional flow production process and we have these buckets here, where our material is getting stored unnecessarily; these three buckets we can see. This is just our analogous representation of our production flow line and it is being represented by the flow of stream of water.

So, unnecessarily it is getting stored here which could otherwise be avoided and when we use the JIT philosophy this is our suppliers. We get the material at the right time, at right place and in right quantity, and we can see we can have a continuous flow production line. So, material is flowing without being stored at any other place. So, here

we have buckets of material which we can say is the inventory that we have to manage if we are not following the JIT philosophy, but if we are following JIT there are no such stagnant ponds representing the inventory.

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Now, principles of JIT manufacturing, so it integrates with total quality management, production management, supplier management, inventory management, as well as human resource management. So, we can see it is a overall concept of improving our operations making our operations more effective, efficient and productive.

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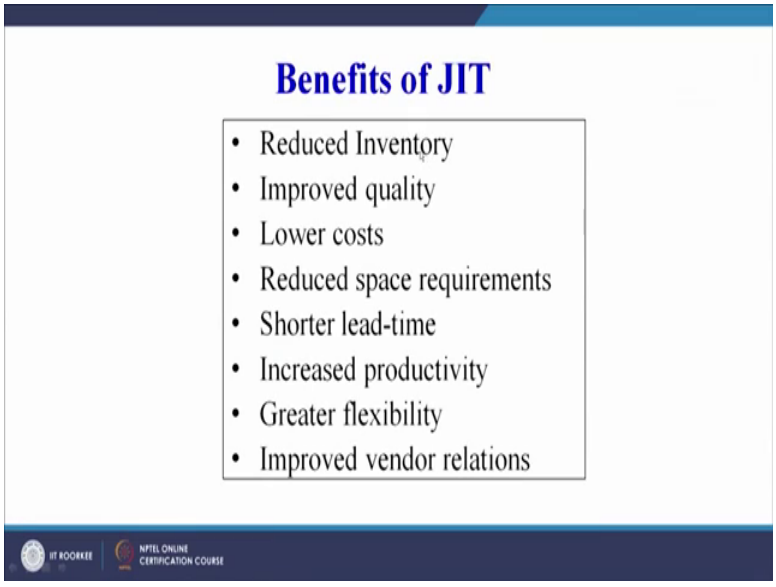

Now, what are the benefits of JIT we can see? I will read it out for you as we have seen with the help of examples also in the stream production flow stream with the help of water. In case of JIT we do not have any stagnant ponds; which means that we have minimum or no inventory in case of JIT under ideal scenario. So, our inventory will be less, quality will be more. We have seen that the rejections are very very less, so our overall quality of the product will be more. Costs will be less because if you see now 6 instead of 6 people only 1 person is managing the total production line as in the case we have seen, so that is showing some savings in terms of the input cost.

And therefore, the cost of the product can be managed. So, lower cost will be there, space requirements we have seen in the case study, 50 percent space is saved if we use our common sense and if we do a proper scientific layout of our machines and equipment. Shorter lead time, increased productivity, greater flexibility, improved vendor relations. So, we can that if we apply the JIT concept we will be having several advantages.

Now, what can be the disadvantages of JIT? First thing is because we are ordering the material not too early and not too late, so, sometimes danger of disrupted production due to non-arrival of supply. So, since we are ordering just in time, so there can be a problem if we do not get our supplies do not get our raw material well in time. Then it will lead to lost of loss of sales. Why? Because demand is there, our production line is responsive but we do not get the material at the right time. So, we will lose those sales highly dependent on suppliers. So, suppliers have to be fully responsive and proactive in satisfying our requirement of the raw material.

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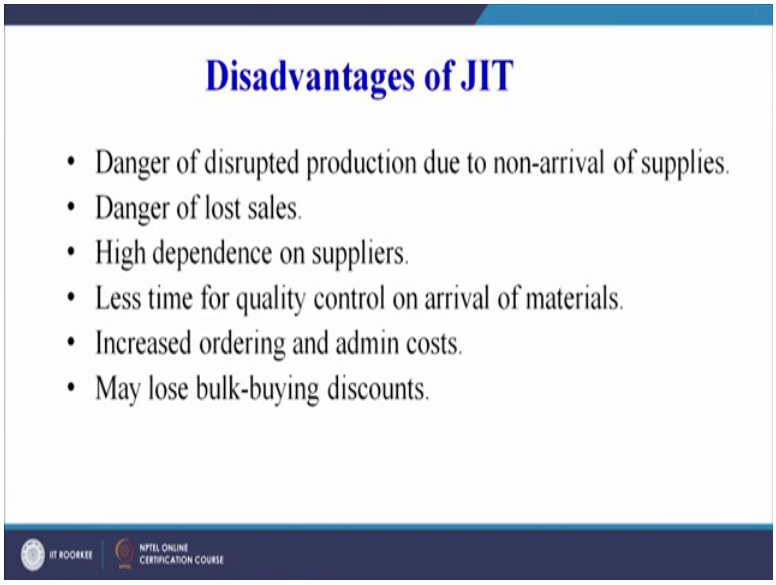

Less time for quality control on arrival of materials because we do not want materials to be stored at any given time they have to come and they have to be used in the most effective manner. So, sometimes we may not be able to exercise a very good quality policy on the incoming raw materials. Increased ordering and administrative cost; so, if you remember in the previous week we have discussed materials management, there we have seen the ordering cost.

So, ordering cost is directly multiplied by the number of orders. Since we are not going to store the materials for a longer period of time, because we want reduced inventory. So, we will have to give number of orders. So, the number of orders if will increase the overall ordering cost may increase, may loss may lose bulk bind discount; so if you remember in materials management we have seen that there is a concept of quality discount that if you order beyond a particular number of product you will get some discount.

But here since we are ordering in chunks, since we are ordering in small lot sizes, small batches, we may not be able to take the advantage of the quantity discount. But all this, whatever disadvantages we have barring the disruption of the supplies; all other may be increase in the ordering cost or may the quantity discounts that we are not able to avail by applying this philosophy. These type of disadvantages are over weighed or are may be taken care by the advantages that we derive out of applying this philosophy.

So, may be within this short span I think I have tried to explain in 20, 25 minutes the basic concept of JIT that is to make our systems more efficient and effective. Eliminate all types of waste that are there in the system. And ensure a smooth production flow line within the organisation. With this we close today's session. In next session we will discuss the concept of Kanban followed by materials requirement planning.

Thank you.