Toyota Production System
Prof. Rajat Agrawal
Department of Management Studies
Indian Institute of Technology – Roorkee

Module No # 01
Lecture No # 05
The heart of TPS: Eliminating Waste

Welcome friends. So, now, we are entering into the final session of this week 1, the course on Toyota production system is going to help us on developing the manufacturing excellence. Now, when we are talking of excellence, let us try to understand that what is in the core of that excellence. The core of excellence depends upon how to do those things, which are going to help you in achieving the customers objective and not do those things which are not going to contribute in the customer satisfaction.

And therefore, in today's session, we are going to discuss that core aspect of Toyota production system which is in Japanese known as Muda. Now, we are talking to Muda that means waste and eliminating waste is the core of Toyota production system. Now, when we are talking of waste and elimination of waste is important thing from the Toyota's point of view. So, normally there can be two perspective to see this waste one is from the manufacturers point of view and another from the customer's point of view.

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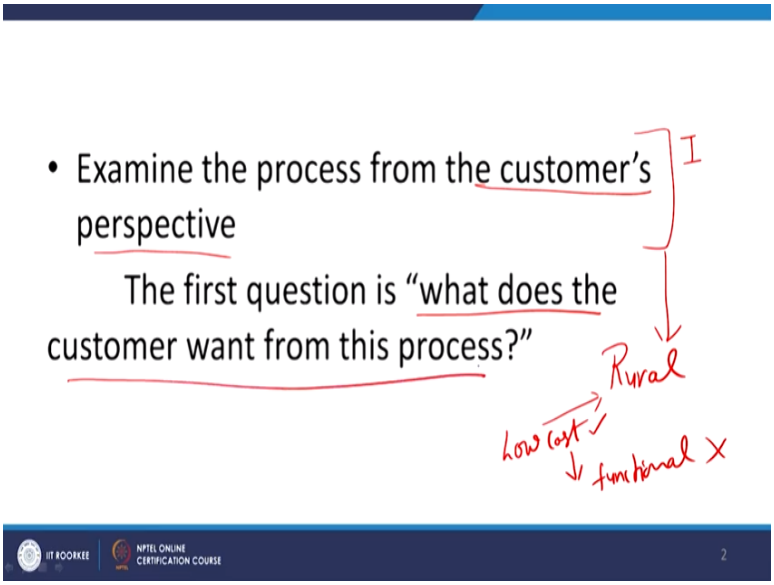

Toyota Production System says that when we are talking of waste, we need to see the customers perspective. Now, this customer's perspective is important that what customer's sees as value that is value and those things, which are not going to increase the customer satisfaction, all those are non-value. So, this is the first important thing in the Toyota Production System discussion.

That we need to have a customer's perspective and this customers perspective is going to help us in identifying what is value and what is non-value? Now, let me take you to a very simple example. In my previous sessions also, I have demonstrated this particular thing that in India, large number of population is in rural areas. Now, when we are talking of rural areas, most of the manufacturers, most of the marketers feel that we need to give those products, which are low cost products.

So, as long as we understand that we need to will give low cost products to the rural area, because they are purchasing power is less it is acceptable, but because of low cost, if you reduce their functional aspects that is what acceptable. And it is what that most of the manufacturers most of the marketers are failing in Indian rural markets, because for reducing the cost that they are also reducing their functional abilities.

But in a rural market, customer wants a good functional product, but he wants only those functionalities which are required to him we purchase a smart mobile, but we use only 10% of the functions of that smart mobile and remaining 94% functions, we are either not aware or we are not in a position to use those functions, because of various reasons.

But we hardly mind because we have a good purchasing power and therefore, we are able to afford that costly product without using its complete functionalities, but it is not so, in the rural market, we want only limited functionalities which are going to help us in my daily life and I only want to pay for those limited functionalities. So, therefore, this gives you the differentiation between customers perspective for identifying what is value and what is not value.

And therefore, it is a subsequent question that what does the customer want from this process, when I am doing a manufacturing process, when I am doing the generation of services. Now, in that there is a entire conversion process, we have discussed that there are inputs, inputs are

processed and those inputs become output. So, this processing is there now many a times we only believe that customer is concerned with the output.

But in reducing that output, the process which is involved, that plays a very crucial role, because this is going to define the various aspects of this output in terms of quality, in terms of cost, in terms of delivery speed, in terms of innovativeness and all these things are somehow related to customers perspective, what type of quality a customer is expecting, how much a customer is ready to pay for that quality, how much is the waiting period for the customer, what type of newness a customer is expecting in the product and all those things are dependent on your processing part that how you are processing that input into the output.

So, therefore, what are the expectations of the customer from that process, that is going to decide what is value and what is waste and therefore, Toyota focused very heavily Toyota's entire philosophy, tools, technique, etc., are around this very aspect of eliminating waste from our processes. If we can identify those waste, and then by doing certain type of continuous improvement activities can eliminate the waste, it is going to help organization in two ways.

It is going to help with improving the quality it is going to help organization in reducing the cost. So, since beginning we are saying that the miraculous concept of Toyota is going to help us in achieving that trade off, where a customer is looking for better quality product with lower prices. So, both these things are simultaneously possible, when we are able to identify waste and eliminate those waste.

Now, let us see what are the different types of waste which Toyota has identified there are seven types of waste which Toyota has identified and we will discuss, but one by one all those ways which are mentioned in the Toyota way.

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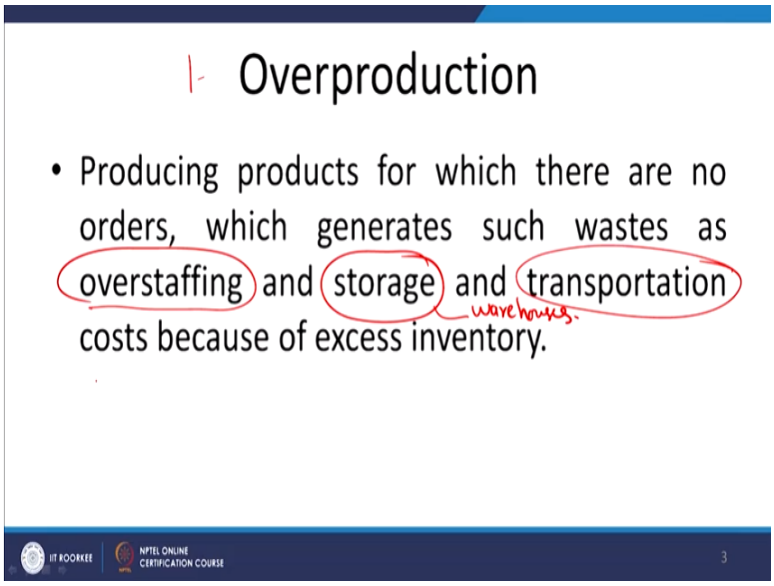

Now, the first waste that is suggested by Toyota, that is the waste of overproduction, now the waste of overproduction is producing products, for with there is no order which generates waste, such as over staffing a storage and transportation costs because of excessive inventory. Now you do not have order, but you are producing products without order when you are producing product without order, you certainly require manpower.

So that will result in over a staffing because there is no order, but still you are producing it and therefore manpower is involved, you are staffing people you are paying their wages etc. The second is when you have produced that you require some kind of storage facility, you require warehouses. And then you need to transport those production from the site of production to the side of storage. So, that requires the additional expenses on the transportation also.

So, all these things are happening, because you are doing the overproduction the order is not there, but you are still producing the product. Now it is always not necessary that you do not do overproduction. In some of the cases, overproduction becomes your way of doing the business particularly those products, where input is some kind of seasonal agricultural produce, like for an example, in India, we have only a particular season of sugarcane.

So, now whenever you are going to have the crop of sugarcane, then only you can produce sugar. So, even though order is not there, immediately, but you have to produce sugar out of that particular activity, so that you can fulfill the demand of the whole year. So, this is how you may

go for overproduction in some of the cases where you have some kind of seasonal input only input is available in a particular season.

And therefore, you have to keep the stock readily available for the demand of whole year, but in all other products, for example, if I talk off automobiles if I talk off mobile phones, if I talk of garments, if I talk about furniture, so many other products you can name if I talk of FMCG's. So, those products, which are independent of such kind of seasonal inputs, over production is certainly a type of waste, since this idea came from an automobile company, therefore, because the input is non-seasonal, therefore, it is a typical kind of waste in that scenario.

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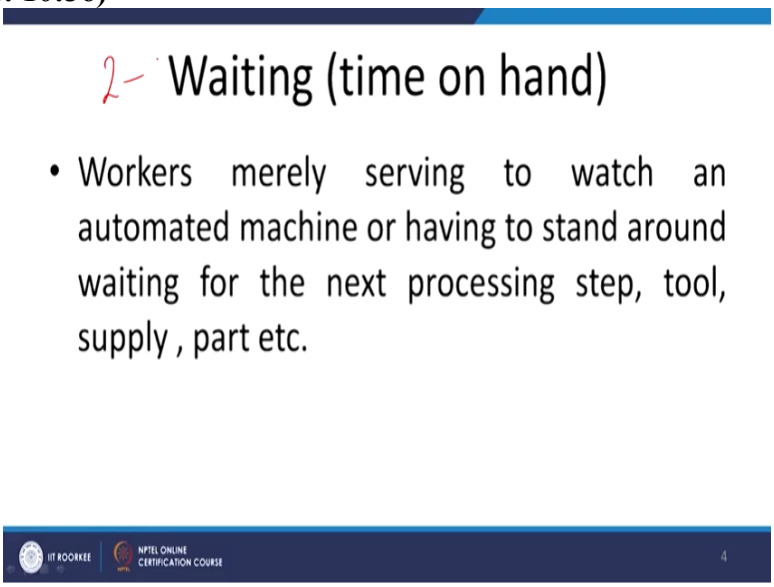

The second type of waste is the waste related to time the waiting, that is the time in head that is the second type of waste which is identified now workers merely serving to watch an automated machine or having to stand around waiting for the next processing tool, supply, part etc., Now, we see that in many organization, the assembly line is completely automated, but still you keep from workers at distance, so that they are just watching that things are happening perfectly in order.

So, that is the type of wastage of human resource that automated systems are there, but is still for double check, because manpower is available to you at lower cost, you are misusing that manpower. So, that is also a type of waste which is the waste of time of human resource you are having a completely sensor driven entry to a building, but still you are keeping a gatekeeper there which is serving no purpose.

Because you are going to that building your face is being recognized by the camera there and in if you are an authorized person, the gate will automatically open and you will enter into the building, but still you are keeping a security personal there if still you are keeping a gatekeeper there. So that you can understand is the wastage of time of somebody or it is the wastage of human resources.

So, this is happening particularly a large number of Indian organizations, where some degree of automation is happening, but it is still manpower is there, they are keeping the manpower, they are watching simply the processes assembly line in the idle manner without doing anything productive on that. So, that type of waste is a very important waste, because it is again going to increase the cost of your final productive. So, that is the second type of waste.

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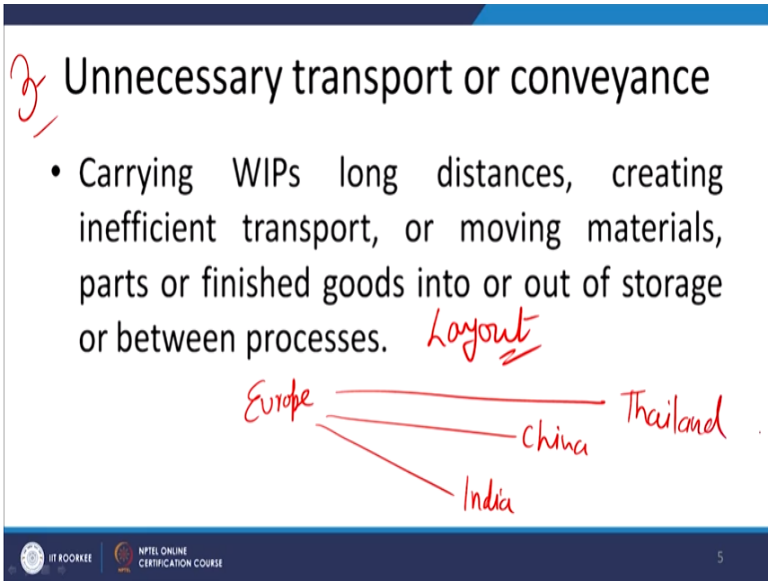

The third type of waste is unnecessary transportation, unnecessary conveyance of products from one place to another place. But this particular aspect came from Toyota in a different reference, but I want to take you to a different reference also. Now, what does it say? It says that carrying work in process inventories long distances creating in efficient transportation or moving materials parts or finished goods into or out of storage or between processes.

Now this particular issue is basically a layout problem in the organization's if your layout is not appropriately designed, so, your work in process will move from one machining center to

another machining center then from this machining center to this machining center. So, if unappropriate layouts are there, there will be unnecessary movement of work in process inventory from one machining center to another machine center.

So, we need to certainly minimize because this will create lot of problems in movement of the goods, this will create problems of accidents also, this will create problem of congestion in the workplace also and therefore, lot of activities are happening, how to solve this type of unnecessary movement activities. And therefore, if you see in our layout related discussions, we have cellular manufacturing, we are creating machining centers, so that we can minimize unnecessary movement of goods during their processing stages.

So, this will help us in improving the energy efficiency of the plant, it will help us in better utilization of the time and you can also solve a lot of traffic related issues with respect to movement of your semi-finished goods inside your plant. So, that is one aspect. But another thing which is happening nowadays, that because of globalization, what is happening that organizations maybe you are in Europe and you are procuring semi-finished components from different Asian countries.

Some components are coming from India, some components are coming from China, some components are coming from Thailand and then you are doing the assembly of these components at Europe. So, you are trying to actually take the advantage of cost minimization from these different locations, but if I see it from the Lances of sustainability, because of transportation, lot of carbon emissions will be taking place and that is NT thesis to the sustainability.

So, though, you may have some cost advantage, because you are procuring different components from low cost destinations, but you will be creating another problem that is of sustainability. So, at the time, when this Toyota Production System came the issue of sustainability was not that serious, but today, the movement is related to sustainability directly, if you have excessive movement, it is inversely proportional to the sustainability.

So, for sustainability also, even if I talk within a plant, if I talk only within a factory only, then also we need to have minimum movement of goods from one place to another. And this will help us in minimizing the energy uses and that will help us in improving the sustainability out of that

plant. So, if I talk sustainability with respect to entire supply chain, then also and if I talk sustainability within a plot, then also in both the cases the transportation or the excessive transportation is a challenge is a barrier for that purpose.

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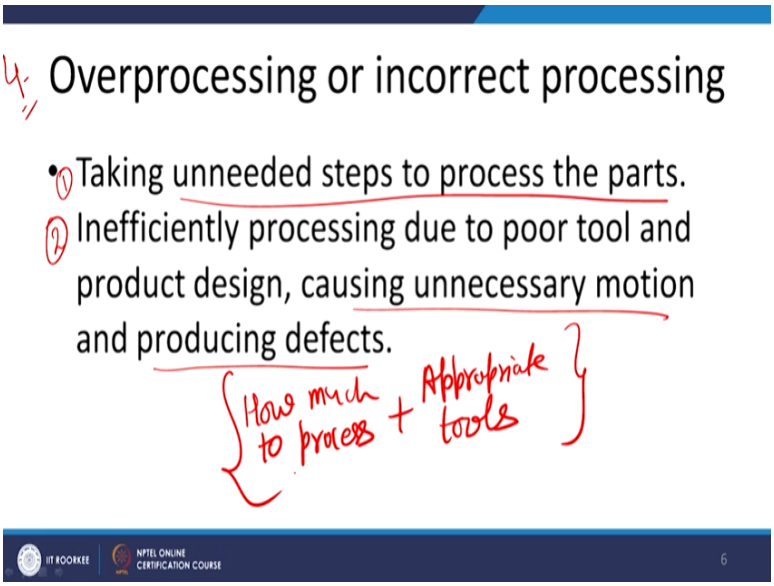

Then fourth aspect that is over processing or incorrect processing many a times for giving a good quality output, we are doing over processing of our objects, because we feel that customer will love good quality, customer always looks for excellence and therefore, there may be a possibility that some of the organizations may go for over processing of their inputs, when you go for those processing, which is not desirable by the customer, that also results into a type of waste.

So, you need to see that what is the optimum level of processing if I am producing computer graduates, those computer graduates who are going to work with a chartered accountant. So, they should be very well versed with the accounting systems, they should know that how to operate the software's which are into the accounting domain. But if I teach them some advanced computer coding languages, which may not be of their use, so, it becomes a kind of over processing, that those things which are not required by the customer.

And I am doing the processing just for creating excellence into my product that is going to increase the cost of the product and it is not going to be appreciated by the end customer. So, that also becomes a kind of waste many organizations suffer from this kind of phenomena, that

without understanding the customers perspective, they keep on processing and therefore, I write that taking unneeded steps to process the parts.

So taking unneeded steps means those things which are not desired by the customer, you are doing that type of processing inefficiently processing due to poor tooling that is point number 2 that you do not have appropriate tool. So, you are doing processing again and again. So, that will take more time and it may also result into poor quality of your output and because of poor tool product design, causing unnecessary motion and producing defects.

If you do not have appropriate tool, so, this will also result into more and more defects. Because tooling is equally important, when you are producing a good output without good tools without the appropriate tools rather, it is not possible to achieve good quality. So, you need to have a optimum combination of that how much to process and then appropriate tool and this will help us in minimizing the waste because of over processing an inefficient tools etc.

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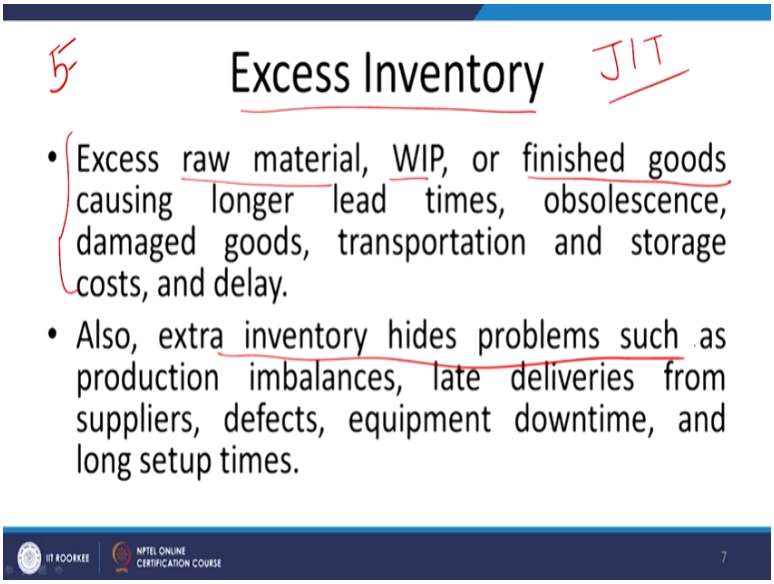

Then another type of waste that is very important and in our supply chain classes, we focused a lot on this waste that is excess inventory is a necessary evil in all businesses. We do not want it but we need to keep it also. So, inventory is such a phenomenon that you are basically keeping it for the provisions that you have some kind of uncertainty in the demands, you have uncertainty with respect to supplies.

And just to match the demand and supply you are keeping the inventory. Now large number of mathematical models are available with us, which help us in optimizing the level of inventory. But still, we see the problem of bullwhip effect we always see even in this era of high IT utilization, we see that there are end of season markdown sales, sometimes customers run out of stock also.

So, all these problems are there because of inventory related issues. And to overcome these problems, companies do excessive production, the first defect which we discuss, that was the overproduction so they create more and more output, which results into excess inventory. And excess inventory itself is a kind of waste, because for me, a customer gives importance to the product.

But for offering that product to the customer, how much inventory you are maintaining, it is not my business. So, for customer's point of view, keeping excess inventory is not going to help the customer satisfaction. So, therefore, this is also a very important type of waste. And I want to emphasize it on again and again in our coming sessions. The reason is that when you keep inventory with you, how inventory eats your profit, you will not be able to see.

So, if you are keeping excess inventory, even though you are having very good sales, but inventory will eat away all your profits slowly and slowly, because you incur very heavy holding costs for inventories, you incur carrying costs for your inventory. So that carrying cost holding cost of inventory takes away all your profit. So, you have to be very, very careful in designing the inventory system for your organization.

So, inventory can be of any type of it can be related to raw material, it can be work in process, it can be of finished goods. So all these types of inventories are there so, inventory is possible at the input level inventory is possible at the processing level, and inventory is possible at the output level also. So, all types of inventories are not good and therefore, in Japanese system, we many times talk of JIT just in time, which helps us in reducing the inventory level and it talks of internal customers as well as the external customer.

So, we need to see from the customer's point of view, whether it is internal or external, and we should be able to fulfill the requirements and whenever there is a need, if we are able to provide

the product at the same time, there is no need to keep the inventory. So, this is one aspect, the other aspect that is related to cost. Now, the other aspect is a serious aspect which is again, you can say antithesis to Toyota production system.

Toyota Production System always say that you need to bring problems to the surface, if there is a problem, do not hide the problem, bring problem to the surface, bring problem in front of the top management of the organization. But in this case, what happens if you have more and more inventory, you may hide your problems and therefore, problem may come that there may be some kind of imbalances in your production line.

But because you are keeping the inventory you may not be able to see you may not be able to solve those imbalances of your in production line. So, that type of problems are there may be some late deliveries from one machine to another machine, there may be some internal starvation, there may be some late deliveries from the your suppliers point of view, but all those problems may not come to surface because you are having a good amount of inventory with you, but all these are the problems.

So, if you have a bulky system, a system full of inventory, these problems will not surface out. So, if you have a lean system, if you have a system with minimum inventory, all these problems will immediately be highlighted and then you can take some kind of corrective actions. So, it is not good excess inventory is not good from the cost point of view also, an excess inventory is not good from the identification of problem point of view also, because it hides your problems.

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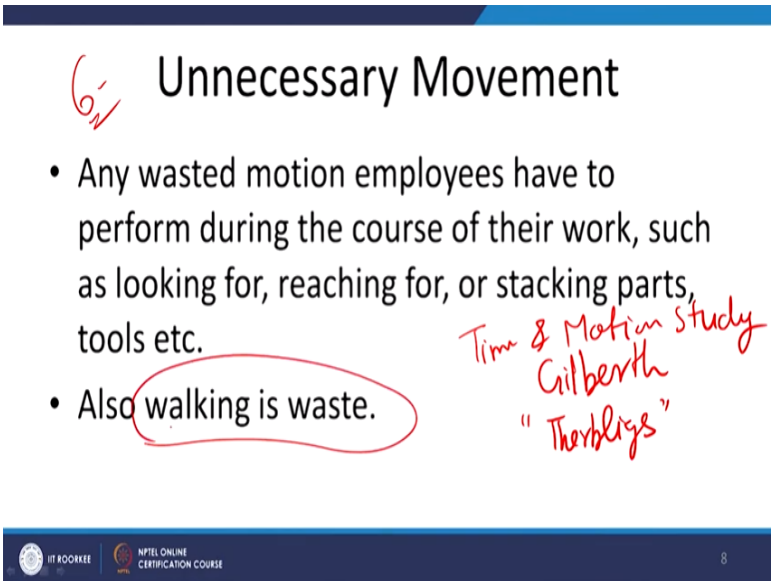

Then another waste is unnecessary movements the sixth waste is unnecessary movement. Now, we have already discussed that excess transportation and we related that discussion with respect to sustainability also now this unnecessary movement means that when I am in a plant, I move from one place to another place from that place to another place that point to another point. So, that is particularly related with respect to unnecessary movement of a person, unnecessary movement of the employees.

And here you can also remember the discussions of time and motion study which were proposed by Gilbert and these are known as Therbilgs where they mentioned that if you do unnecessary movement, you will be exhausted at an early time and you will not be able to produce for continuous shift of 8 hours. So, you need to keep your energy in a intact manner. And for that purpose, you need to avoid unnecessary moments if you are unnecessarily walking in the plant.

So, that is also said to be a waste it is specifically mentioned that walking is a waste though walking is good for health, but walking in terms of a plant walking in terms of a manufacturing system unnecessarily is a kind of waste it is not adding any value to the end customer. So, you need to minimize the movements of our employees. Therefore, we need to position our employee in a plant all such optimum locations which can minimize their movement with those locations those stations.

And again if you go to the layout discussions, normally the place where employees are standing in the plant is at a slightly higher stand so that they can see from their eyes a larger distance otherwise, you need either unnecessary movement or you need more people to cover the same area. So, that is related to unnecessary movement of your employees that is a waste.

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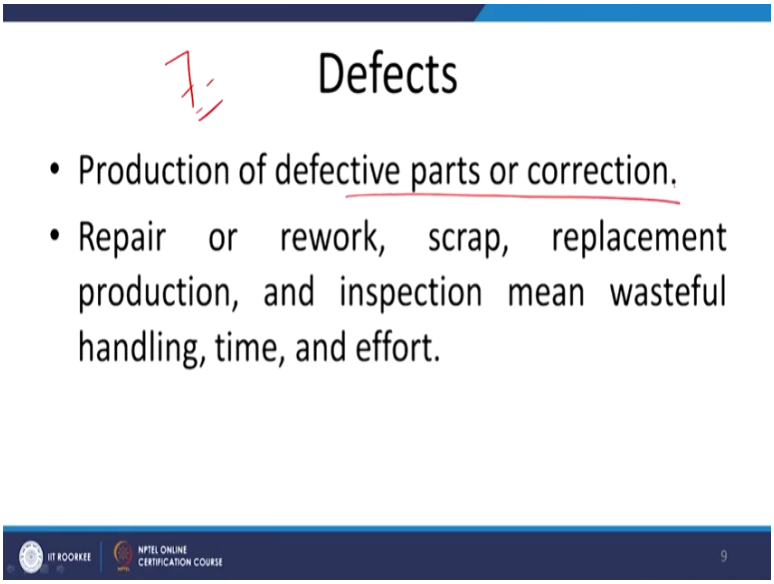

Then another waste which is very important the waste related to defects, if your system is not producing good quality output, if your system is not producing output, which is acceptable as a finished product. So, it will go as a scrap or it will go for rework it will go for repair. So, whether it is a scrap so, already you have done a lot of processing on it, and now it is coming to scrap so that whole cost of processing is going to waste.

Same thing is with case of rework, repair everywhere some type of cost is involved, you are not going to get any additional benefit out of it, but you are incurring additional cost because of defects you are generating in your processes. So defective products and taking some kind of corrective actions on that is a type of serious defect and then it is also going to reduce the overall output rate from your organization.

When your defective pieces are coming out of your production system you have to rework. So, the overall output rate will also reduce. So, that is the second kind of challenge because of this defect. So, we need to discuss about this defect in detail in our upcoming sessions. But it is a

very, very critical issue that we need to identify. Then there are some authors who have identified one more type of waste in the organization.

So seven waste which we discussed, were the original waste given by the Toyota Production System.

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Now, this is an additional you can call it as eighth waste that is unused employee creativity in your organization, people are working from lower level to top level and many a times because you do not have the proper engagement platforms, you are not able to use the creativity you are not able to use the productivity their ideas for the benefit of the organization and when it happens, that is also a waste of human resource that is a waste of their talent.

And therefore, many organizations are now following the concept of involving the workers in the decision making process. So things like workers participation in management, quality, circle, etc., are those initiatives which is started to handle this kind of aspect that how we can improve our employees participation in organizations benefit, how we can harness the creativity their potential for the benefit of the organization.

So, this is many times a challenge for any organization that they consider their employees just to follow the orders and they are not understanding that they can also contribute in the organization's success in more than one way. So, that is a waste for many organization and we

also need to see that how we develop those organizations therefore, the term learning organization has become very popular these days that organization should be a learning organization where everybody should be able to contribute for the success of the organization.

So with this, we come to end of this session, where we discussed the various types of waste, which are identified under Toyota Production System thank you very much.