Toyota Production System
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Module No # 03
Lecture No # 11
Pull System

Welcome friends, now, we are entering into the third week of this course off Toyota production system. And we have already started discussions on 14 principles of Toyota production system. And as we have already said that these 14 principles are coming from 4 P philosophy of Toyota and right now we are into the second P of our discussion, which is based on process. And as we discussed in our last session that when you have the right process, you will produce right product.

So, going further into this second P aspect, today we are going to focus on the very important aspect of manufacturing and service organizations that is the concept of Pull system. Normally, we see this pull system in the case of supply chain management, but Toyota has pioneered the concept of pull system in a production environment also. And the concept of pull system is very much useful to avoid a very important waste.

The first waste, if you remember, was the waste of overburden. And that overproduction can be minimized by using this concept of pull system. Now what is this pull system that we will see how can we achieve this pull system in our organization that is what we are willing to discuss in today's session.

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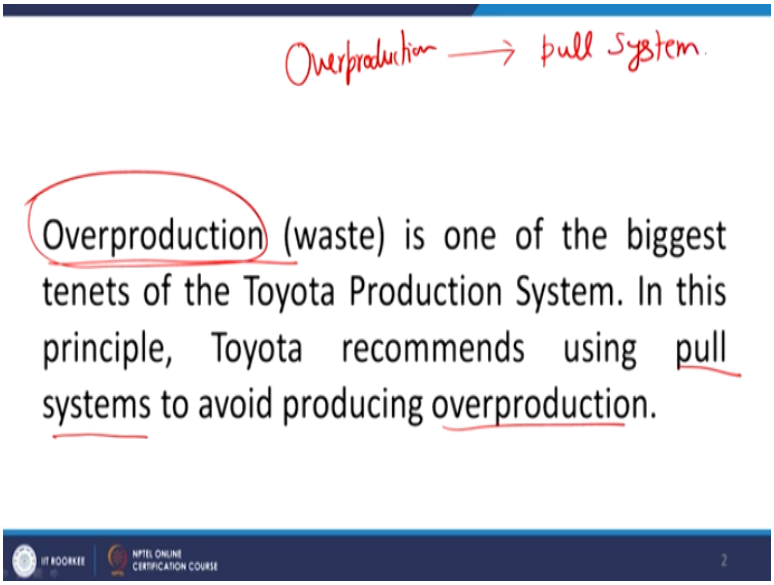

Now, as I am saying that overproduction is one of the important waste which is being identified by Toyota. And there are various other kinds of waste, which are directly related with this waste of overproduction. Now, other kinds of waste, like keeping more inventory requiring more space, the possibility of hiding the defects, possibility of hiding your inefficiencies, all these types of waste or challenges, which are there in achieving the excellence are coming because of this waste of overproduction.

So, overproduction is the first important type of waste identified in the 8 waste, which are there in the Toyota Production System. And by using this pull system, we can avoid or we can almost eliminate this waste of overproduction. So, if you see that waste, which we have discussed in our earlier sessions, so, how to eliminate those waste. So, the overproduction is a waste that is a challenge, which is limiting your ability to achieve excellence and the solution for that is pull system.

So, if you apply pull system of manufacturing, then you can achieve the elimination of this overproduction based. Now before we go further in the manufacturing environment, let us see some examples, the common examples in our own life and I have 2, 3 cases with me. And with the help of these examples, we will like to discuss that how pull system is actually happening in our own life also.

For example, you have a vehicle maybe a 2 wheeler, maybe a 4 wheeler. Now, how do you decide when to go to a outlet for getting your tank refueled there is no proper planning that every Monday you will go to the outlet every Monday you will go to the petrol pump for getting your tank refilled. If you have this kind of system, that on every Monday morning you are going to a petrol pump for getting your tank refueled some time, you will find that there is not enough space in your tank, because last week, you have not you are out of station.

So, therefore, you did not drive your vehicle and therefore, there was no consumption of petrol and there is no space there is no empty volume available in the tank for getting the additional petrol and it is also possible that on some Friday evening, you are running out of stock because this particular week, you are running excessively from one place to another place and you consumed more fuel and therefore, the expectation of running the fuel by Sunday evening got exhausted on Friday evening.

So, everybody has an indicator in the vehicle and based on that indicator, you decide when to go to that petrol pump.

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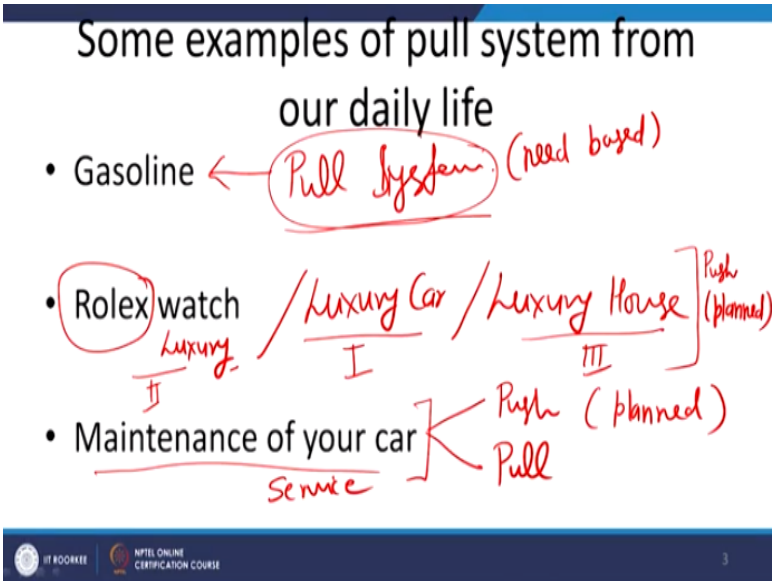

So, that is a very good example that we follow pull system in our life. Now, another example I am giving you of the Rolex watch, we all need some kind of instrument for knowing the time many of us use nowadays, mobile phones for knowing the time and many of us use watches. Now I am particularly mentioning about this Rolex watch or you can say any luxury watch.

Now, when I am using a luxury watch, how do I decide because there are various kind of luxury things which I may require, I may require a luxury watch, I may require a luxury car, I may require a luxury house. Now, all these are my luxury requirements. And when I am using this adjective, luxury, it means that these things are not immediately required. And when these things are not immediately required, I may plan that how will I schedule their purchase, first I will purchase a luxury car.

Second, I will purchase a luxury watch then I will purchase a luxury house. So, this way, I can schedule my activities of purchasing various luxury items for my daily life. And most of these things are not immediately required. Therefore, I can follow a push kind of system means I have a well planned activities for purchasing these items that when I will get a service, I will purchase the luxury car when I will be getting married, I will like to have a luxury watch when I will be getting promotions, I will have a luxury house.

So that kind of planning is possible in case of these luxury items. So, it is not the pull kind of thing because pull thing comes when you have immediate need. So when your indicator in the fuel tank indicates you that your fuel is coming into the buffer zone, now you only have the safety inventory available with you. So, immediately you decide that I need to refuel I need to replenish my stocks.

The third is the maintenance of your car. Now in maintenance of your car, you have 2 types of cases sometime you go for a planned activity that every 6 month you want to visit a garage and want to get your vehicle checked that is a planned activity. On the other hand, sometime all of a sudden, there is some issue in your vehicle and you want to immediately fix that issue that is a kind of pull approach.

So, this is an example of service requirement in your life. And service requirement can be either push means planned or either pull which is need based. So pull systems are more need based and push systems are more planned that you can have a systematic component you can have the timed planning for those activities that is the part of push systems. But in our daily life, you can now count that most of the things you go to your house and see the storeroom of your kitchen.

Now in storeroom of the kitchen, large number of items are there sugar is there oil is there, that the spices are there different type of food grains are their pulses are their flour is there. So, all those items are actually procured in your house on the basis of pull system, whenever you see that the container which is containing a particular kind of pulse is getting emptied, then it trigger comes and that trigger will help you to procure additional pulse.

You do not purchase all these items, that every month on the first of the month, I have to purchase all these items depending upon the need, you decide what to purchase on a particular day, whether you talk about vegetables, you talk about fruits, you talk of anything. So, many times almost all the items, but on the other side. Even in this list, there are few items like milk in our house, that milk is a item which we purchase almost on a scheduled basis.

Maybe you do not consume that much amount on a regular basis there though, there is a almost regular day consumption of milk, but it is quite possible that in someday you may not have consumed enough milk and therefore, you think of using that extra milk for some additional purpose, but most of the items are procured in our daily life on the basis of Pull system. So, the argument is there, when our daily life can be planned on the basis of need on the basis of pull system, how can we implement the same system of pull based procurement in our production environment.

So, that is what this Toyota production system will help us in understanding that the procurement the management of the production environment on the lines of pull system. Now, what is this pull system as I tried to explain with the help of our daily items.

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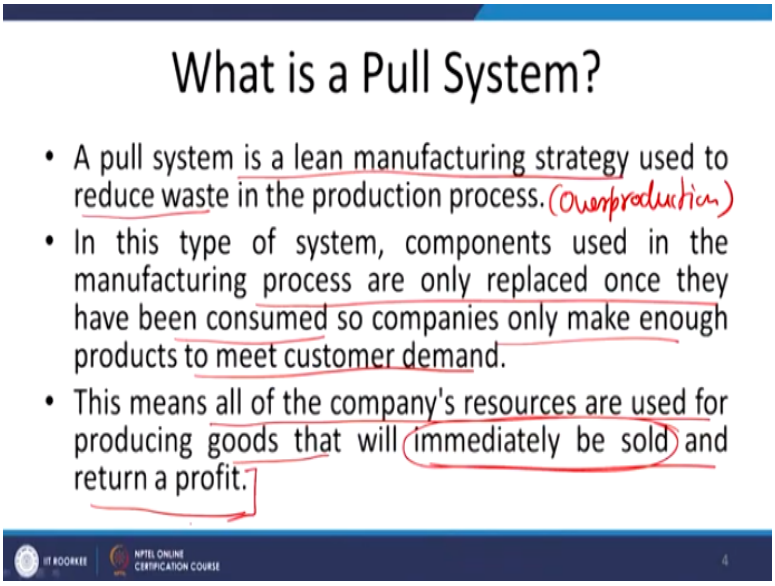

So, the pull system is basically a lean manufacturing strategy, because Toyota Production System and lean go hand in hand the concept of TPS and the concept of lean go hand in hand. So, therefore, this pull system is a very important part of lean manufacturing a strategy which helps us in reducing the waste of the production process of overproduction. Waste of overproduction can be minimized by following this full system.

Now, in this type of system, components used in the manufacturing process are only replaced once they have been consumed. So, companies only make enough products to meet customer requirements. So, this system says that we are not going to produce products in anticipation, we will only produce products, when there is a customer demand, there is a thing that you anticipate the demand of the customer and in anticipation you are producing the product.

But this pull system says that we will only make that much product for which there is a demand of the customer. So, that system is actually when there is a real demand, there is no anticipation in that this then this pull system comes to play that it means that all of the company's resources are used for producing goods that will immediately be sold and return a profit.

So, as I was giving the example of gasoline, that you will stop to a gasoline outlet, as soon as you realize that there is a requirement of refilling your tank. Same thing happens in case of pool system that all your products which you are making will be immediately sold and why it is

immediately sold? Because you are making these products against the real customer demand not anticipated customer demand.

So, that is the basic idea of pull system that there exists a demand from the customer side and then buy manufacturing by supply chain, you are fulfilling the demand. So, all your products get absorbed by the customer and therefore, you get immediate return because you are selling the product.

So therefore, you immediately get a return you immediately start incurring the profit otherwise, if you are doing in anticipation, you will stop those products in your inventory you will wait till order comes and you do not know when the order will come maybe orders may come in 1 month, maybe 2 months or 3 months or even orders may not come because it is in anticipation.

So, you are not very sure that how much profit you will earn from that production activity. But here the profit is guaranteed because these production activities are done against the real demand. So, that is one very important thing with respect to pull system.

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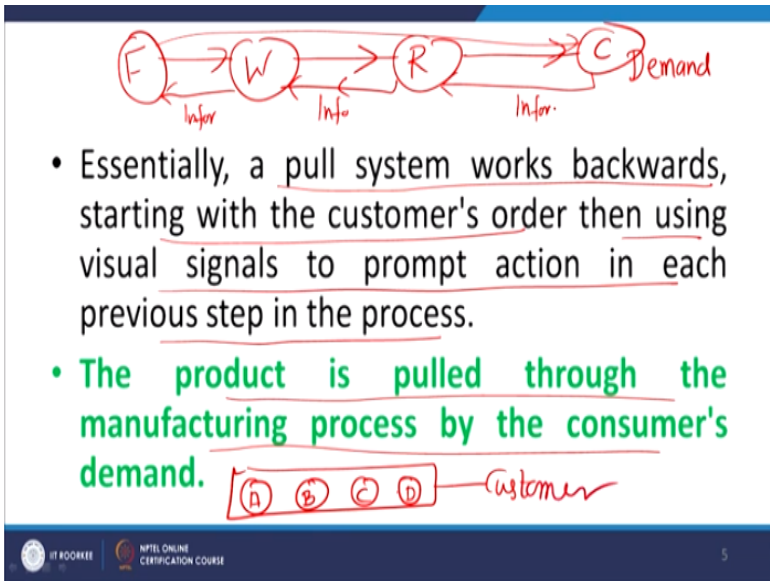

Further talking about the pull system essentially a system works backwards is starting with the customer's order and then using visual signals to prompt action in each previous step in the process. So, it is actually a system which is a starting from the customer side to the

manufacturing site. So, though the system of supply chain is like that, where it is your factory, it is your wholesaler then it is retailer and this is customer.

So goods are moving in this direction, from factory to wholesaler, wholesaler to retailer and retailer to customer, but when we are talking of pull system, so there is a flow of information which moves from customer site to retailer from retailer to wholesaler and wholesaler to factory. Now, in response of this information flow products will start flowing from factory to wholesaler to retailer and to customer.

So, this is how this is a system which is generating which is the trigger point is the customer and you can say it in the language of marketing also, that customer is the most important driving force in a business nowadays, because all our activities are centered for the customer satisfaction. So, the pull system is starting from the customer.

So, without much stress, you can automatically understand that this is a system which is going to give you more customer satisfaction than any other kind of manufacturing system, because based on customer order, you are starting the all your activity and therefore, you will be in a better position to customize your products as part of the customer requirement. If you have something already available in your stock, then you have to fulfill the demand of the customer from that stock only.

So that real customization may not be possible, but since here the starting point of the entire activity is the customer itself. Therefore, better customization is possible in case of this pull system. And the final words about the concept of pull system is that the product is pulled through the manufacturing process by the consumers demand as I discussed this particular diagram, so the demand is the starting point. And now, the customer is pulling this product from the manufacturing process.

So, each stage whether within a organization I talk if there are multiple activities, which are happening ABCD. So, each activity subsequent activity downstream activity is pulling product from the previous activity. So, B is pulling from A, C is pulling from B and D is falling from C and somewhere here is the customer. So, customer is also pulling that product from the entire manufacturing process.

So, that is the essence of this pull system that we are forcing, we are creating a sense of urgency to our previous stage in the supply chain for sending the product to my stage.

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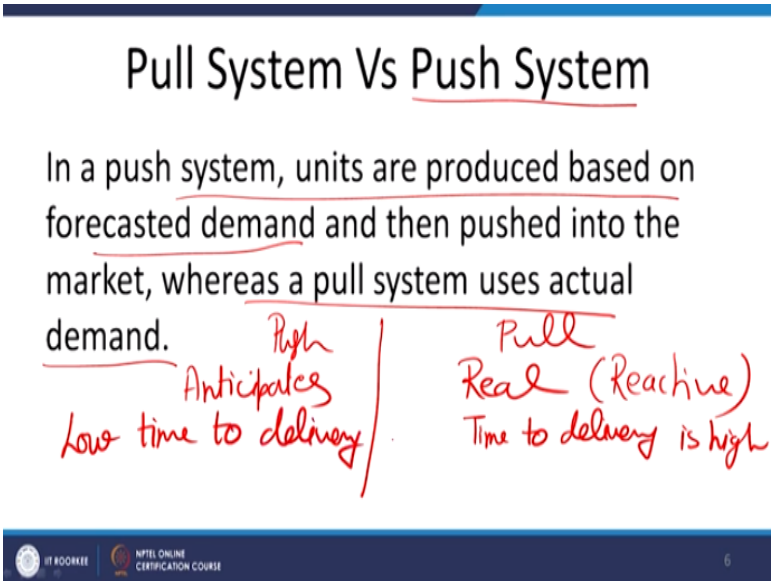

The other popular word when we are discussing the pull system, the popular word is push. So, it is important from the theoretical point of view to differentiate between pull and push system, what is a pull system? And what is a push system? Now in a push system units are produced based on forecasted demand. So, the forecasted demand means the anticipated demand. So, in anticipation, we start production activity and we produce that there will be a demand in future.

We expect that there will be a demand in future and we need to fulfill that demand. Therefore, we are stocking these products in anticipation. So, the role of forecasting is very important in case of push system, if we want to make a push system successful, we need to have good forecasting models, the models which can give us accurate demand accurate values for the future period. So, if you have good accurate demand, then probably your push system can work.

But since it is anticipated values, it is always not possible to have accurate forecasting models. There are large number of uncertainties, forecasting values always have forecasting errors. And because of these forecasting errors, you always see that there are either stock outs or there are excess inventory after a particular season. And then you see end of the season markdown sales,

because you have produced more items you anticipated higher demand, but actual demand was less than that.

So, now you have excess inventory available with you, what will you do with that excess inventory. So, you create that end of the season markdown sales price, and you want to clear your inventory you want to free your space from that old stock. So, that is a problem which may happen with the poorly designed forecasting models. So, there is a lot of research going on, because all companies are not working on pull system a good number of organizations work on push system also.

So, that is also happening and that is a system which is based on anticipation and the pull system that is a system which is based on real demand. So, if I want to differentiate between push and pull, so, you can say that it anticipates the demand and it actually work on real demand that what is the real demand, maybe some of you can say that, it is a kind of reactive system it is proactive, it anticipates and it is reactive system.

Some of the people those who are critic to pull system, they say that time to delivery is high in case of pull system and you can achieve very low time to delivery in case of push systems, because things are readily available in your stock you have made to stock and this pull system is also known as made to order. So, when you are made to order you may take some time to produce the product, but when it is made to stock two things are readily available in your shelf and you can immediately give that product to your customer.

So, that gives you lower time to delivery. So, in those products, where customer is not ready to wait if a customer needs a cold drink a soft drink and at that time a customer goes to the retailer and retailer says okay I will prepare this soft drink. So, customer is not ready to wait for that purpose he wants immediate solution and therefore in anticipation he stocks the product but on the other side you go to a shop where fresh juice is being sold fruit juice, vegetable juice is sold.

Now, customer is going for getting that fresh juice. Now at that shop, if the shopkeeper is anticipating that customers will come and I should keep the juice ready, nobody will go to drink that juice. Now, whenever a customer walks into that shop, only then the shopkeeper will prepare

the juice. So, that is the difference between the pull type of arrangement and the push type of arrangement.

So, almost similar kind of products, both these products are the drinking products, but in one case, we want low time of delivery and on the other side, we want we are happy with the higher time of delivery. So, we need to see that in which case pull system is acceptable and in which particular case pull system may not actually work.

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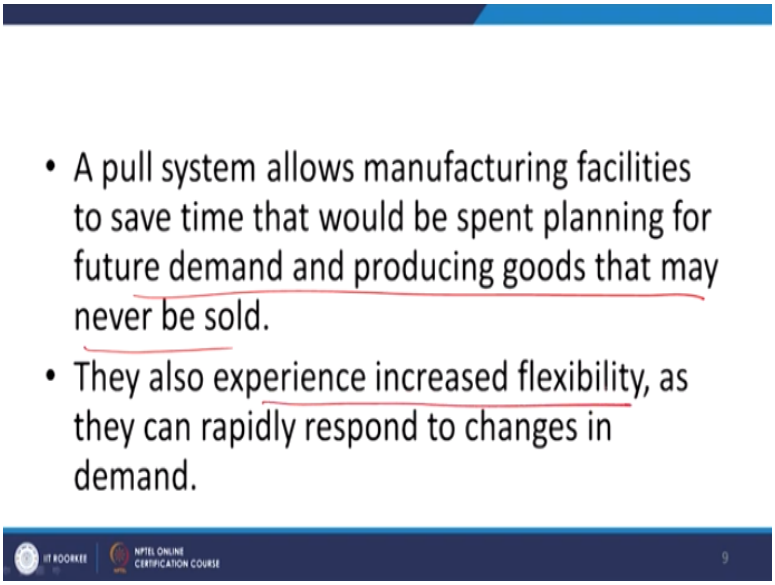

Now, based on all this discussion, we finally can say that what are the advantage of using a pull system. So, it reduces waste within a company particularly with respect to overproduction, we discussed already in detail, it helps in freeing the space because you are not creating piles of inventory. So there is no excess inventory. So you have lot of space available in your plant or rather you can say that with a smaller space also, you can run your outlets.

Then you also have increased customer satisfaction, because you can actually provide a lot of flexibility, when you have this pull system and you can manufacture you can design you can produce product as per the specific requirement of your customer. So, this is also possible, when you have the pull system the real flexibility can be possible with pull kind of system. Then, since products are made in small quantities in both system as per the demand you are willing to manufacture the product then you will be able to identify quality related issues much easier.

And when these issues will surface quickly you can go to their root cause analysis and because if error is there, you will not have many things for you can say rework or generating scrap, because you have pull system, only few defective pieces will be there. So, the cost of quality will be much less in the case of pull system, if you produce more products, and then you surface the defect, then the cost of reverse scrub will be much higher.

So, in this particular case, the cost of disposal or the cost of quality will be much less. So, these are the benefits of pull system. Now what pull system you see that allows manufacturer to save time, because in a manufacturing environment, when you have the mass production or the batch production, which creates inventory, now lot of time is used for planning future demand and producing goods that may not be sold.

Because you are producing and you have used your resources, you have used your time, time of labor, time of machine for is stocking some items. Now, these items may give you good return may not give you good return and may not give you at all any return and therefore, you can use your resources in a more efficient manner, when we are using the pull system of manufacturing. And then as we already discussed that, you enjoy more flexibility, because you can rapidly respond to the changing customer requirement.

So that additional flexibility is possible, when you have this pull system now when we want to implement pull system in the organization.

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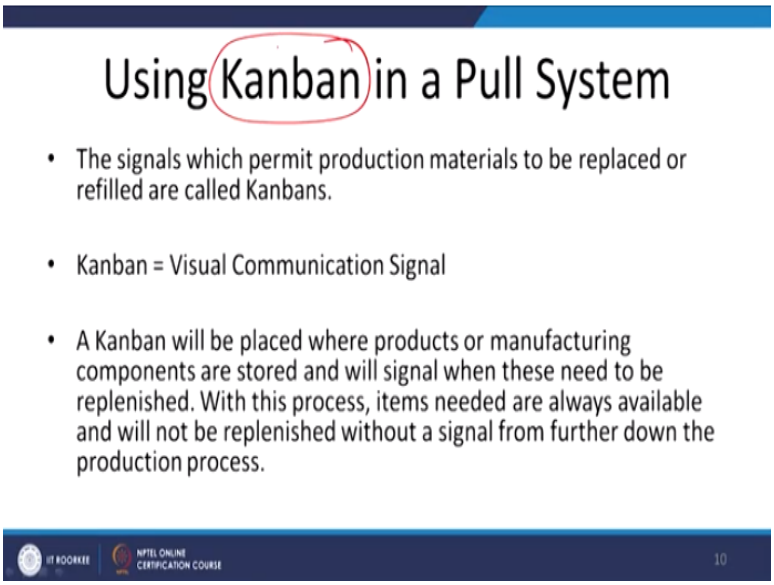

Toyota gave a very interesting concept with the name of Kanban, we will be having a full session on Kanban I am just introducing Kanban U at this moment, which are actually the visual signals, we have one principle of Toyota production system where they talk off using more visual communication signals and Kanban is one such type of visual communication signal.

Now, this visual communication signal is a signal which is used to start that there is a demand at my station, and when there is a demand at my station, I will start producing products from the previous station, so that I can fulfill the demand of next station. So, for an example, if there is a station A and station B so, as soon as there is a green light at station B so station A understands that there is a requirement of product at a station B.

So station A will start sending products to station B and as soon as there is a red light at the station Be it means that there is no need of products at the station B so the supply from station A will be stopped to station B so this is a very simple example of visual communication, that by just having red and green lights in your assembly line, you can think of that where there is a need of product and where there is no need of product.

So same thing can be extended to your entire organization or to your entire supply chain also. So that is the concept of Kanban. There are different types of Kanban systems, there are different types of visual control systems, you can design Kanban as per your requirement, even an empty

container can also be a Kanban. Like, if, again, there are 2 stations A and B, at station B, I am using 2 containers for keeping the material.

Now out of 2 containers in 1 container becomes empty, and I send that empty container to a station A that gives a signal to station A that there is a need of product at the station B so the station A will get into action and will start filling that container A so that it reaches to the station B so even, you can design your own style of Kanban depending the usefulness depending the ability of your employees to understand those visual signals. So that is a very important thing in the pull system implementation.

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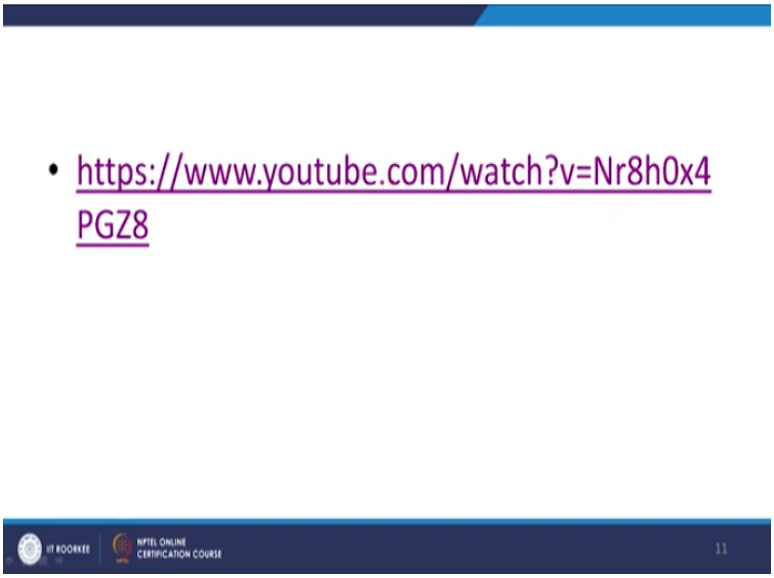

This is a small video from one of the organization of Toyota plant. And this video will be available to you through YouTube source, I have placed the link of this video here. And you can see this video in YouTube. And it will help you to understand that how these visual communications are being implemented in different types of Toyota plant. So this is from one of the plant of Toyota, which helps you in understanding that visual communications are designed in the form of card also.

This is a video which says that how different types of cards are there. And these guards give you a signal that take from one station to another station. And that is how you can think of that. Yes, now I need to start production at my station so that I can fulfill the demand of the next station. So with this, we come to end of this session. And I request you to go through this video which will

help you to understand the working of Kanban system in Toyoa production environment thank you very much