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

Module No # 03
Lecture No # 13
Get Quality Right the First Time

Welcome friends, so, as we are discussing about various principles for implementation of Toyota production system and nowadays we are discussing those principles which are focusing around second P of TPS parameter that is getting the right process for getting your right product. And now in Toyota production system one very important aspect is developing your process, so, that your process can take the responsibility of producing the right product and there should not be any check there should not be any requirement of inspection later on.

If we can develop our production process to such a level that it automatically takes the responsibility it takes the control of the product which it is producing, that is one of the ultimate objective of Toyota production system. And therefore, in this session, we are going to discuss that how to get the quality right at the first time and this system which will tell us that how to get the quality right at the first time, you can automatically understand that will produce minimum defects.

And it will also help us in going down the defect to the downstream so that there should not be unnecessarily overworking over processing of those defective pieces. So, the cost of defects should not increase much whenever a defect takes place. Because it is also on the other hand important to understand that you cannot develop a system which is 100% full proof, you try to develop we are continuously looking that how to produce quality first and there should not be any need of second level of check.

So, quality first should be the objective of all the manufacturing services organization, but still because human beings are involved defects are very much possible. But, as soon as there is a defect, there has to be some kind of automated system that we can stop our process and then we can look for the reason we can go for root cause analysis and solve the problem with this what

will happen that unnecessarily over processing of those defected items will not take place and therefore, you will be able to save a lot of cost.

And that will reduce one of the waste in your system that will help you in generating competitiveness for your organization. So, that is what we are going to discuss in this session. Now, when we say that quality right the first time.

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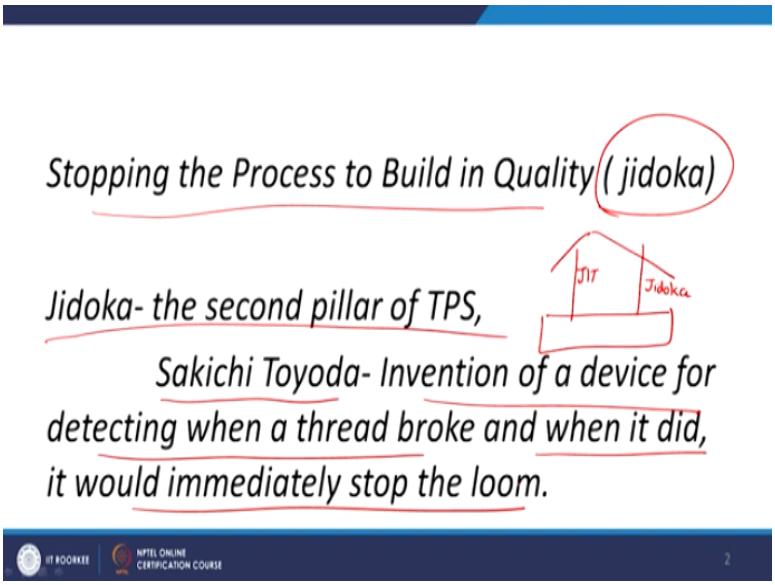

So, there is a term in Japanese which is defining this particular aspect that is known as Jidoka. Jidoka says that you have to understand to stop the process to build quality in it there is a philosophy that we should continuously run our production process. Because there is somebody else who is standing at the downstream to check to inspect the quality of my output. So, there is no need to stop the process.

Because if I am stopping the process everybody will see me as a kind of villain in the organization. So, there is this kind of mindset, which is there from the era of mass manufacturing, continuous production, but the concept of Jidoka says that we need to develop our manpower, we need to develop our employees to such a level that they are empowered or they can take the responsibility of closing the production line if need be.

So, this is one very important aspect of Toyota production system and as we have discussed in Toyota Production System house TPS house, this is one of the important pillar of TPS house. The

other pillar if you remember this was the TPS house. So one of the pillar was JIT and the other pillar is this Jidoka. So, Jidoka is one very important aspect of Toyota production system, that how you infuse this quality culture in your organization.

So, this is all about infusing the quality culture into your organization. One of the important person who was basically responsible for giving this idea of Jidoka to TPS, his name is Sakichi Toyoda. And he basically invented many things at the shop floor. And one of the important invention, which he did, that is invention of a device for detecting when a thread broke. So, in a textile or during some kind of loom processes, if a thread breaks it how a machine can automatically detect that there is a broken thread.

And then when it happens, the machine should immediately stop the loom. So, this device was there, because if there is a broken thread and that broken thread is going into that loom, so, when the final product will come, you will see that the design there are certain defects in that piece of cloth and when there is a defect in the piece of cloth, it will amount to large amount of rejection, that rejection may happen at the inspection stage that rejection may have at the customer stage also.

And if that reduction happens at the customer stage, it will bring a lot of bad name to the company. So, therefore, as soon as when some textile process is going on and there is a broken thread this device automatically sense that yes, there is a broken thread and it stops the loom and you can automatically detect that where this broken thread is there and you put a fresh thread and if there is a repeated breaking of thread, then you will see that root cause analysis will come into picture you will ask again and again why it is happening on this particular line only?

And therefore, you will see that either some pressure is extra and pressure is extra because you have not done the proper lubrication of that particular loom So, you can go to the basics of particular problem by doing this kind of capacity building of your employees and by allowing them to stop the process and this whole concept is known as Jidoka. So, that is what we are going to discuss that is Jidoka.

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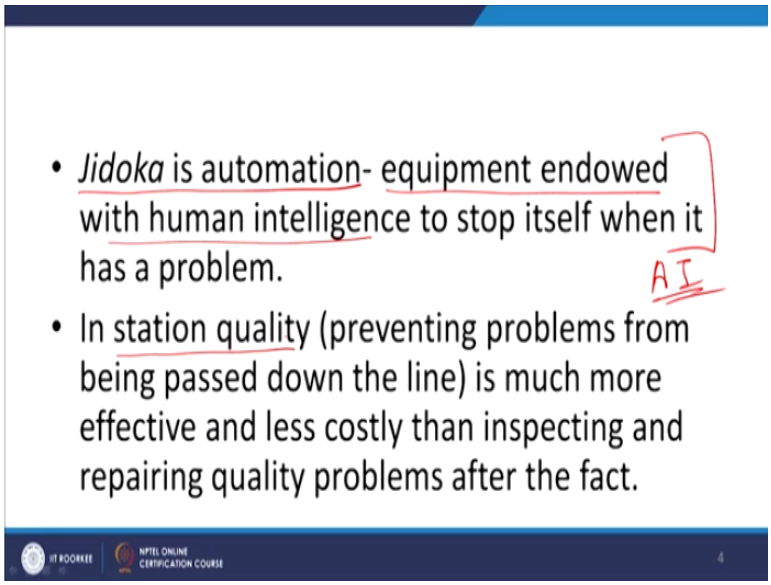

Now as we say that Jidoka says that you have to build in the quality into men and once you built in quality into your employee, then that quality will come into machine alone a very high standard machine a very advanced machine cannot produce quality product unless until you have built in quality into the employees who are working on that person. So, that is different fundamental premise on which the concept of Jidoka is based.

That means it means to have a method to detect defects when they occur and automatically is stop production. So, an employee can fix the problem before the defect continues downstream. So, let us say there are these 3 stages ABC now if some defect has occurred at stage A then you are going to B and C. So, as soon as the defect occurs, you should be able to stop the process. So that that defective piece does not go to B and C.

Otherwise what is possible that that piece will go to ABC that defect has already occurred at A but now you are doing processing at B also you are doing the processing at C also on that defective piece. So that all processing the resource consumption for doing that processing is just generating waste. So, this is the meaning of Jidoka and how you will take benefit of Jidoka for your organization.

Now Jidoka therefore, is very much linked with the process of automation Jidoka is all about automation that how do you develop that automated systems, which will help the detection of defects on its own and then closing shutting down the line. So that defective piece does not travel

downstream in your assembly line in your production process. So, Jidoka is very close to automation.

And as we all know, that nowadays in our industries, more and more automation is happening, more and more robots are coming. So, the concept is becoming more practical, more possible to be implemented. So, we are doing that equipment endowed with human intelligence to stop itself wherever there is a problem. So, the example of that device, which was able to detect whenever there is a breaking in the thread and stopping the machine.

So, that type of intelligence, we are now developing and that we all know is AI, artificial intelligence, that is what is going to happen in industry 4.0 that your machines are going to become smart machines are going to become intelligent, and where your machine will have human intelligence, you will be able to implement Jidoka in a better way. Because then what are the different possibilities of the fact that already you will keep in the database of that machine.

But many a times new types of mistakes may also commit new types of mistakes may also happen and that only human intelligence can identify. So, if you can transfer that human intelligence to the machine, and that is what is happening in artificial intelligence and machine learning kind of activities, when your machine becomes more and more learning entity that with the passage of time machine starts learning itself.

So that is going to be great enabler for the process of Jidoka in the organization now what it says further that whenever we are discussing about the quality management, in quality management, you will always realize that preventing some kind of defects, prevention is always much better or it is also cost effective, then actually curing the defects, if you produce the defect and then you go for repair, rework or any other kind of substitution of that defective piece that is a very costly exercise.

So, the idea is you need to have more preventive mindset that I am going to develop a process where no defect is produced. So, that is quality is keeping at the forefront in the aspect of Toyota production system. Now, how does it work? How does this Jidoka work, so, we are giving a new term that is Andon.

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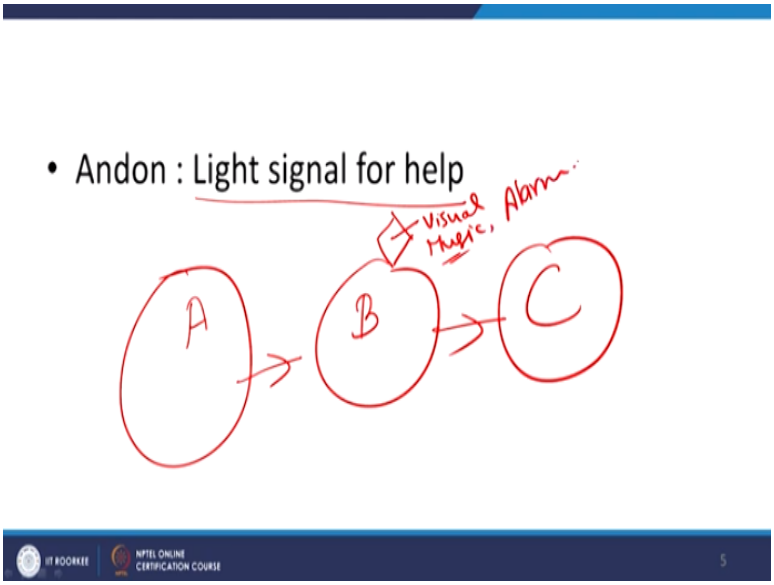

So, there are a lot of Andon's systems in our plants, wherever we have this Jidoka implementation and these are light signals for help that you have some machine A, B and C now production processes going on there happens to be A some problem at machine B. So at machine B there will be some kind of signal which will automatically create an alarm and normally this signal will be in the form of some bulb.

So, there will be some bulb which will help you to identify that there is a problem at B or even a music can also be there. So, it can be some kind of visual or music or some other kind of alarm. So, when you travel in Aeroplane, you know that whenever you need help of Air hostess, so you just press a button. So, that is a kind of alarm that an air hostess by seeing that bulb, which is there on the top of your head identifies that yes, this person needs some kind of help.

So, that is a small signal, which is not disturbing the all the passengers travelling in that aircraft, but because there is a sound as well as that light. So, with that combination of sound and light, the air hostess recognizes that which passenger requires her help. So, same thing is happening in the Andon's so, that is one example of a Andon's system with most of us have experienced the same thing happens in the organization when we are implementing Jidoka. So, Andon is a very important tool for implementing Jidoka in the organization.

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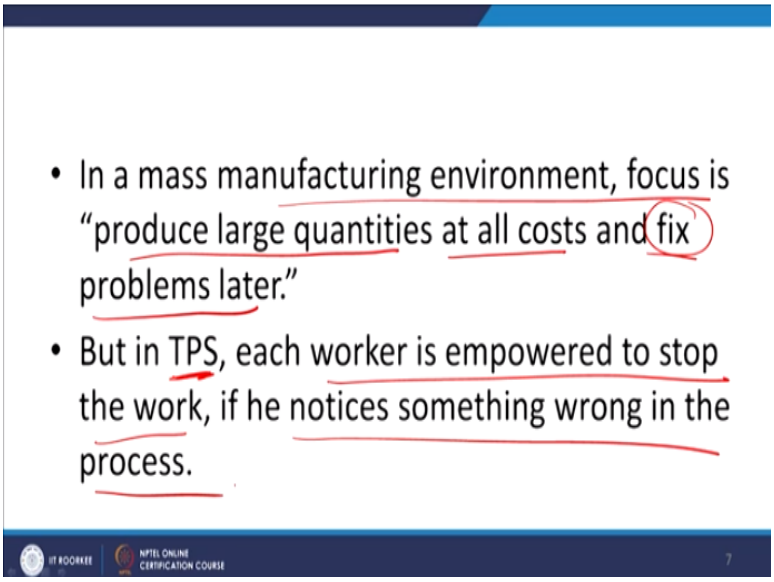

So, if I see with the help of this diagram, so, in that diagram, you can see that in first picture here, this person is standing and he is feeding this machine manually and watching the machine cycle. So, this is entirely the manual thing, this is manual. Now, from this manual, some degree of automation has started that now the automatic feed is happening and this person is just standing and watching the machine cycle.

So, some degree of automation with respect to feeding has started and now you see more automation. Now, what is happening in the more automation that the feed is automatic, now the person is not there, this person has been removed and now what is happening, we have this system this is a Andon.

Now whenever this is going to have some kind of problem, this Andon light will glow and because of this Andon light the shop floor manager the manager who is looking after that particular machine will come to know that there is some kind of help required at this machine and they will the machine will automatically stop because of some problem and this light will also come and then those workers will come they will see why this problem is there and then they automatically solve it and the machine will start working again.

So, this is the Jidoka system that from complete manual basis of feeding and checking the machine cycle we have replaced this particular worker by this automatic ejection system there is an Andon signal that Andon signal will only be up when there is a problem and when there is a

problem an Andon signal is up you will solve that problem you will go for root cause analysis and once you have solved the problem machine will start working again.

So, this is the development of system on its own development of capacity of the system. So that the system can detect the problems and system can be stopped when there is a problem and then Andon will help us to create that sense of urgency that you have to solve this problem immediately. As long as that Andon signal is there you have to be have that kind of urgency that yes, we have to solve this problem immediately for the interest of the organization.

Then let us go back between this Jidoka philosophy and the mass manufacturing philosophy. Now in the mass manufacturing philosophy, which started particularly from organizations like Ford etc., because they are the pioneer of starting the mass manufacturing assembly line systems in the production operations. So, in that the idea is in mass manufacturing environment produce large quantities at all costs and fix problems later.

The meaning is that even if you are able to sense that some defective pieces are coming, but still you are producing the products and what you will be doing you will keep those defective pieces separate from the assembly line you will remove those defective pieces, because you are also anticipating that in the production of these defective pieces, some okay pieces are also there. So, please remove these defective pieces and we will separately work it out we will separately rework these defective pieces.

So, this is the idea that we have to produce continuously large quantities and we will fix the problem later on either we will fix the problem on the same assembly line later on once we have sufficient number of defective pieces or there is a different smaller assembly line, there is a tool room setup available where we will take all those defective pieces and these problems will be fixed there.

So, that is how the mass manufacturing environment works that you have to continuously work without bothering of the defects you are generating in the production process. But Toyota production system as we are saying that each worker is empowered to stop the work. Normally in a mass manufacturing organization stopping the work is considered to be crime, you need to

take a lot of permissions and all the people who are responsible, who can take a decision to shut down the work, they also need to give lot of explanation to their higher ups.

So, nobody wants to take that responsibility of closing the work. So, it is a very you can say bureaucratic kind of organization system. But in the case of Toyota Production System, all the workers are empowered to shut down the plant to shut down their particular workstation whenever the employee sees that there is something wrong in the process. So, if I am an employee in a Toyota plant, and I am walking from the work way, and if I see that something wrong is happening, the process is not up to the mark even I am empowered.

So Toyota any engineer can do that is stopping of the work. So, that type of mindset because the objective is to produce quality and that is the responsibility of each one of the persons who are working in Toyota organization.

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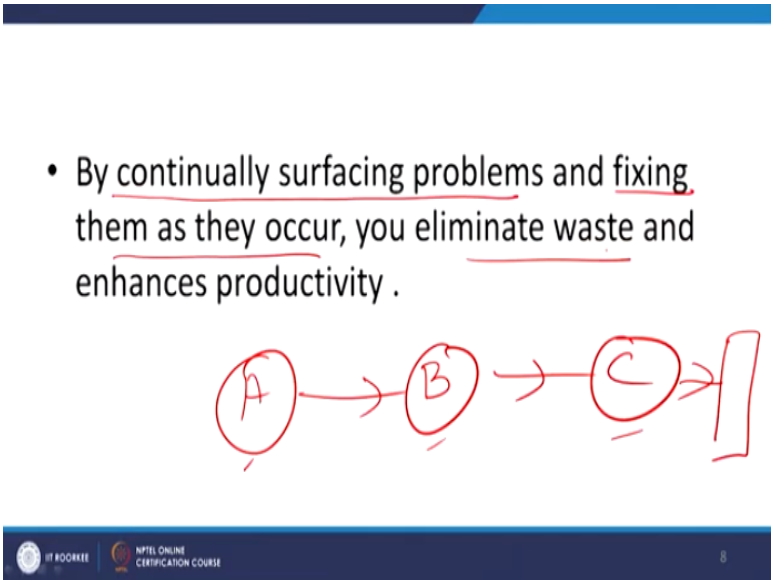

And why what is happening, because of this, they are continuously able to surface the problem as we have discussed that in mass manufacturing organizations, there are possibilities of hiding the problems. But when everybody is empowered, everybody is responsible that defective pieces should not go from my workstation to downstream. So, we all are empowered to close the button.

And the therefore, we are able to identify exactly at which stage problem has occurred, we were discussing the example of three machines producing a product. Now if I realize the defect after the processing has done at all ABC then I have to do a lot of brainstorming a lot of searching that whether this defect was produced at A or B or C. But if I know that all my employees are empowered to close the button, whenever they see that their machine is not performing up to the mark.

So there will be very convenient way that I will be able to surface the problem without much difficulty whether it is at A or at B or at C. So, it is possible to fix the problem as soon as it occurs. And by fixing the problem as soon as it occurs, we eliminate a lot of ways the and it also helps in improving the productivity of my production line because I will not waste much of the time in identifying the source of the problem at the source itself, I am closing the plant.

So, I know where is the source of the problem I will fix So, I will minimize the wastage of time in searching the problem area and therefore, I will have better productivity from my production system following concept of Toyota production.

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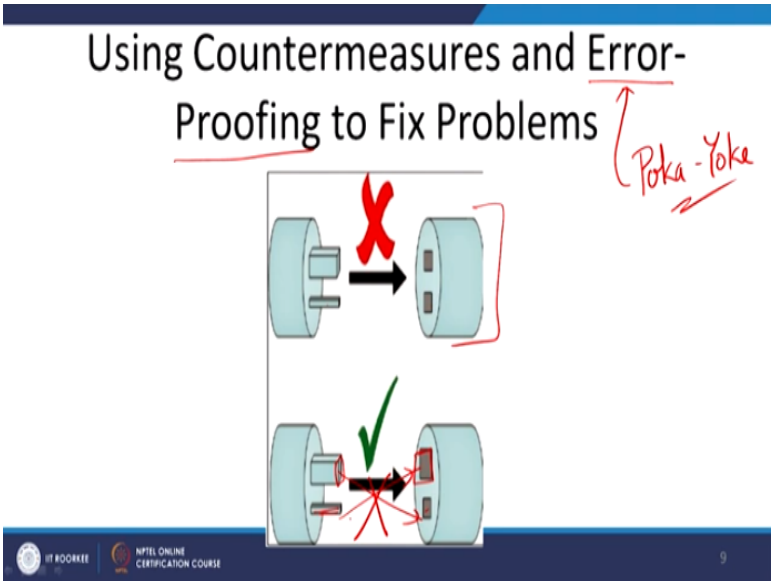

Now other important thing which this quality at the first without creating any kind of rejection is the concept of error proofing this concept of error proofing is also very important in generating quality from your production process. There is a Japanese term for this that is Poka Yoke and the

English version of that Poka Yoke is error proofing. Now you see there are a large number of devices which are following this concept of error proofing.

That means we are developing our system in such a way that there should not be any error for an example, if you have this type of assembly system, the first type of example. So here what is happening, you have two equal size shafts, though the size of the shafts are of different size. So, there are possibilities that some type you will not be able to identify with shaft should go in which hole.

But now, in the second case, you know exactly that, this shaft and this hole are for each other and the second case is this shaft is for this hole. So, you will not have any reason of mistake that this shaft goes into this and this shaft goes into this. So this is not possible. So, automatically, you have created a system where no error will take place, there will not be any possibility of creating any kind of era, you see many times that plugs, electric sockets are now designed on the basis of the concept of this error proofing.

The kind of socket you are generating and kind of plug you have similar shape of male and female devices. So, therefore, these are the countermeasures, we use for avoiding any kind of mistake, the simple example of our pen drives the memory drives. So, you have possibility of putting that memory drive either way into your computers, but because of using this concept of error proofing, there is a larger gap at one side and a smaller gap at the other side.

So, if you try to fit that pen drive in reverse order, you will not be able to insert that pen drive into your system. So, that is nothing but a very simple common example, everyday example of error proofing. The idea of Jidoka says that we need to see the quality systems very simple, and because the people are very important, they need to be empowered.

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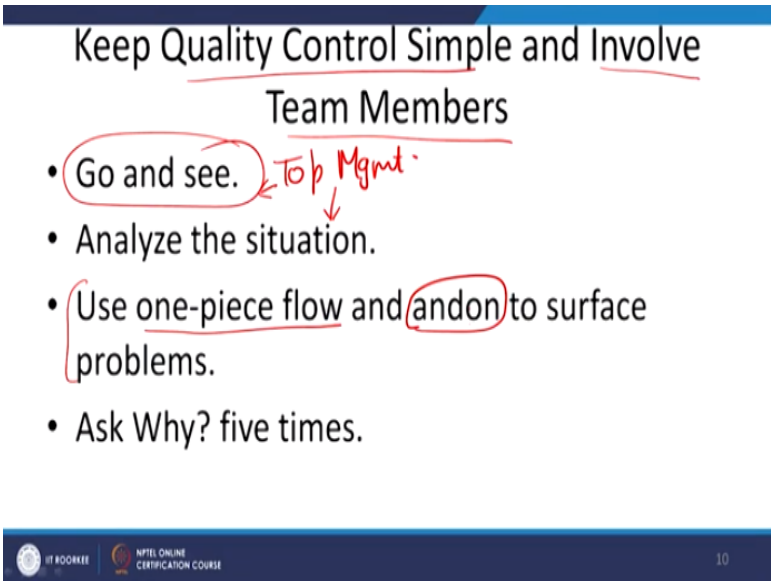

So, we need to involve all our team members in developing this quality system, where we can have the concept of error proofing. So, you need to go regularly, you need to see what is happening at the shop floor. So, involvement of top management at the shop floor is very important. So, top management visiting shop floor is very important. And then because of top management's involvement at the shop floor, everybody is involved in analyzing the situation that why it is happening? How to do it better?

And then we have already discussed that by following the continuous process flow one piece flow and by one piece flow, we will be able to create a system where problems will always be surfaced up and then when we are having this ability to surface the problem and at the same time if we use this Andon system, you will also create a sense of urgency in your organization. So, have a system where everything is working smoothly, we have a regular production flow system and we use the Andon to surface the problem.

And if again and again problems are coming, then we need to see that what is the root cause of that problem. So, we need to ask this question again and again, 5 Y's are there that we will discuss in our subsequent sections that why this problem is occurring again and again occurring at this particular machine. Similarly, we can also build quality in our service organizations, because services are also very important thing and sometimes it is very, very important to have quality at the first time in the service organization.

If you as a patient gets admitted into a hospital and the dose of the drug, which is prescribed by the doctor is let us say 5 MG, but because of mistake of the attended you got 50 MG so you can understand what is going to happen to you. So, though, we discussed the entire concept from the point of view of manufacturing organizations, but building a quality culture in the service environment is I think more important.

Because many a times customer is directly available at the service environment. So, when a customer is there, you cannot take any chances you need to provide good service right quality of service from the very first time.

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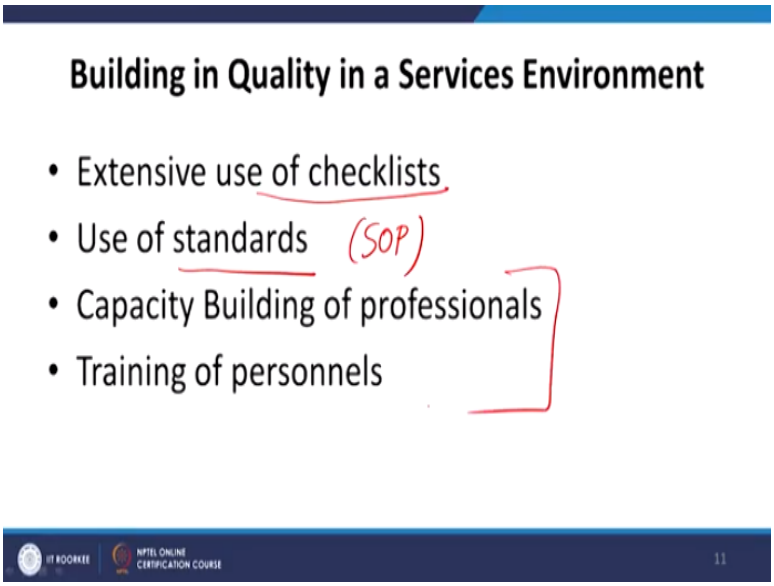

So, for that purpose, there is a extensive use of checklists, how do we provide that Jidoka in service environment for that purpose, extensive use of checklists, there are regularly people develop checklist for healthcare services for banking services for different types of other services also. So, we go for extensive use of checklist before performing the services, we see that checklist thoroughly and we tick mark all the checkboxes so that we are not creating any kind of mistake.

Even if following that checklist, even if following that this standards were standard operating processes are there SOP's if you are not getting the desired quality output, you need to revise your standards, you need to revise your checklist. So, that is how the improvement also takes

place by following the system of checklist at standards. Then these two things are also very important that you have to regularly build capacity of the people who are delivering the service.

And for that purpose training of your employees giving them different types of exposure about using the checklist and what is the philosophy of developing those checklists the meaning of various items in that checklist, that is to be explained to the professionals personals, who are involved in delivering the services. So, this Jidoka is not only applicable to manufacturing, but it is also applicable to service organizations. So, finally, we will see that we have to build quality as a principal quality needs to be built as a principal.

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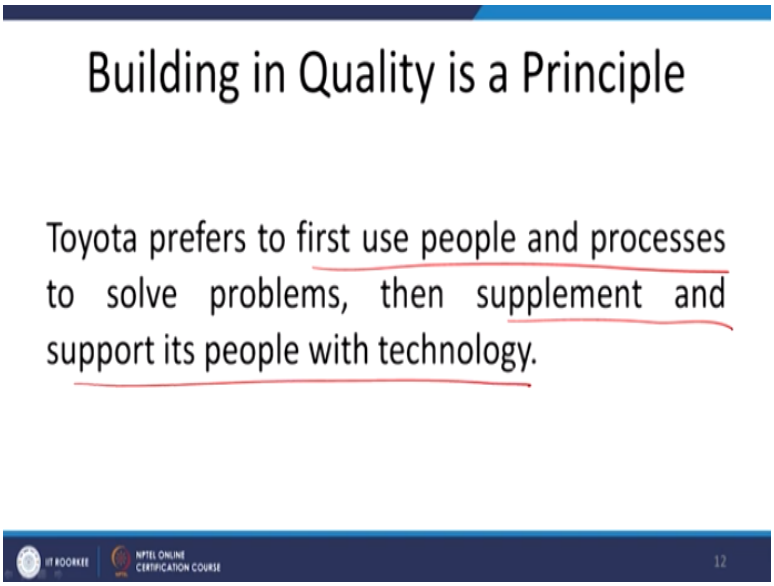

And for that purpose, if you see that the idea of Toyota production system that they gave more emphasis to people and processes to solve the problem and it is very important that first interfaces we need to give this is apart from this Toyota production system, whatever discussions we had, but please remember all the time, that give more emphasis to people and process and then supplement it and support with the help of technology.

So technology should support people and processes. And many a times many organizations give more importance to technology and ask their employees to follow those technologies. So you will not be able to do justice, either with the technology or with your employees. So that is one very important key takeaway of this Toyota production system. So today's session that use your

people and processes and primarily and then use technology to support them. So with this, we come to end of this session thank you very much.