Manufacturing Systems Management
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Lecture - 28
Basic elements of JIT, Kanban systems

In this lecture we see some of the Basic Elements of Just in Time Manufacturing.

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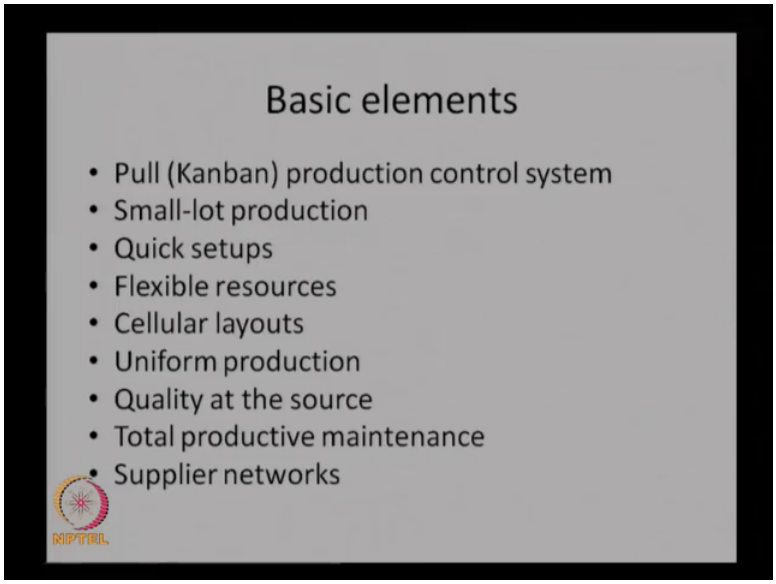

In the previous lecture we had seen aspects such as small-lot production, quick setups, flexible resources, cellular layout, and uniform production. So, we still have to see the pull control or Kanban control.

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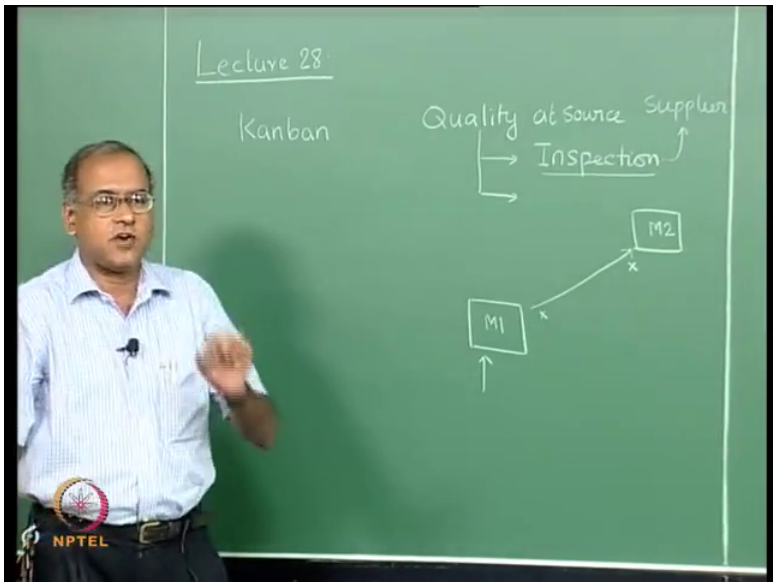

We also have to look at quality at source productive maintenance and supplier networks. Now we have already seen the definition of quality and from a manufacturing perspective quality would be conformance to specification. So, also absolutely necessary that the incoming material is of acceptable quality and the work in progress where machining happens the manufacturing is carried out according to specification. So, it is absolutely necessary to have incoming material which is of the required quality and that there is no reject from the raw material or the incoming material site 1 of the ways by which an organization ensure ensures this is through inspection.

So, there is always inwards goods inspection as the material arrives into the factory for manufacture, now we have to make sure that quality is maintained in all the inward goods. So, many times the organization spends a lot of time and energy to inspect the incoming goods. And then if there is an issue then these things are they go back to the supplier and fresh lot comes in. Now one of the requirements in just in time manufacturing is to have quality at source while it becomes necessary for the organization to do inspection of incoming good to check quality there is an equal responsibility from the supplier side that the supplier sends items with good quality.

So, it is closely related to the last point which is called supplier networks. So, in all organizations that practice just in time manufacturing the owners on quality particularly of the incoming goods is on the supplier and quality is at source. So, many times this

inspection inwards goods inspection is also avoided are eliminated under the condition that the age or the inspection is carried out at the supplier site itself and if the items do not conform to the quality requirements at that point itself they are changed and they do not come to this organization and go back.

So, quality is checked and verified at the source itself and the idea of inwards goods inspection is eliminated. Now quality of work in progress also happens through inspection and in a more traditional system where we had a batch production and functional layout. Let us say if material comes to machine number 1 which is here and then it moves to machine number M 2 which is here we have already seen that when the machines are far away the production batch sizes are bigger particularly if we insist on economic batch quantity, transportation batch sizes also larger because it not possible to transport single piece every time it is manufactured on M 1. It is possible to reduce the transportation batch compared to the production batch, but not to a very small quantity. So, they would still be a batch movement now to ensure that this machining or manufacturer here has been done correctly there is an inspection either here or there is an inspection here.

So, there is a inspection in between and for some reason this inspection finds out that this is not done correctly then there is a reject or a rework depending on the nature of nonconformance to the specifications. Now when such a thing happens when there is reject or a rework the entire batch has to be reworked and it take enormous amount of time to do that now if we have a cellular manufacturing system.

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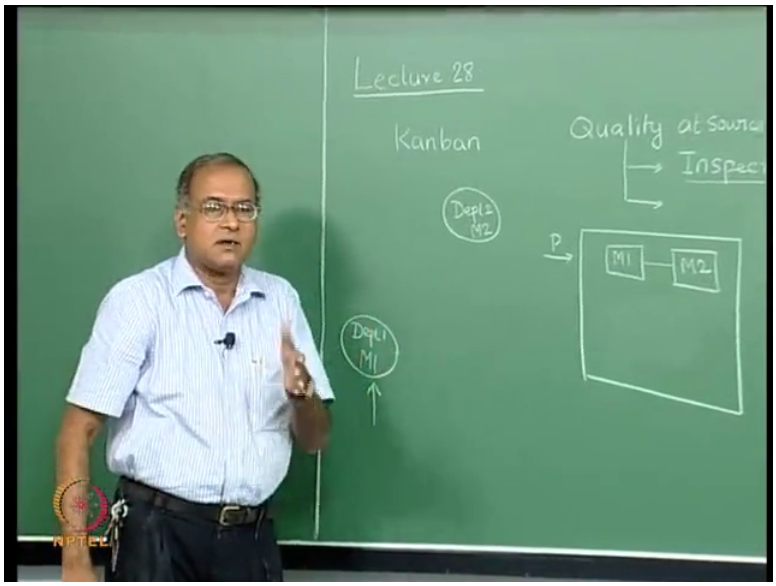

Where the M 1 is here and the M 2 is here physically located close to each other it is possible to have a single piece transportation also we do not keep an inspection here, but the operator himself or herself does the inspection and then sends it to M 2. So, if there is a a non-conformance it is identified when the very first piece comes in.

So, the owner of maintaining the quality is now given to the operator who makes the product and not to a separate inspection team. So, the 2 aspects to it 1 is the owners of quality lies with the person who is making it and not to somebody else. And secondly, because these machines are close to each other physically and a transportation batch of 1 is possible very early during the manufacture if there is a non-conformance it is identified and the number of items that have to go through rework or reject is very less because right at the beginning it is diagnosed. So, quality gets better when we follow a cellular manufacturing combined with a just in time manufacturing philosophy. So, in addition to quality we also have to make sure that the machines are available.

Now, in an older system when we did not have the cellular manufacturing when we have departmental specialization let us say this is department 1 and let us say here we had department 2, where let us say M 1 machine is here and M 2 machine is here. We would say there were several M 1 machines or several machines of the M 1 type are here and several M 2 machine are several machines of the M 2 type are here.

So, if product comes here and if for some reason this particular M 1 machine is not working then there would always be another M 1 machine or another machine of the M 1 type which can handle this, the same way there will be another M 2 machine or M 2 machine that will handle this because this department has machines of M 2 or M 2 type. Now if we have the cellular manufacturing system there is going to be 1 machine on M 1 followed by 1 machine of 2 and say if the (Refer Time: 08:07) comes if the (Refer Time: 08:09) P comes to this M 1 machine in order to get it done M 1 machine has to be up and running.

If for some reason M 1 is down then this thing cannot happen here and the only way it can happen is either to subcontract the operation on M 1 or to subcontract the part itself or to allow intracell modes. We know that all of them are costly in terms of time and in terms of money. Therefore, in order for a system like this to work very well it is absolutely necessary that these machines are up and running. So, the emphasis on maintenance is a little more in these type of systems then here even here maintenance is extremely important, but the emphasis on maintenance is far more here than in the earlier system. So, all these companies that do this kind of manufacturing systems have their own T P M programs which stand for total productive maintenance.

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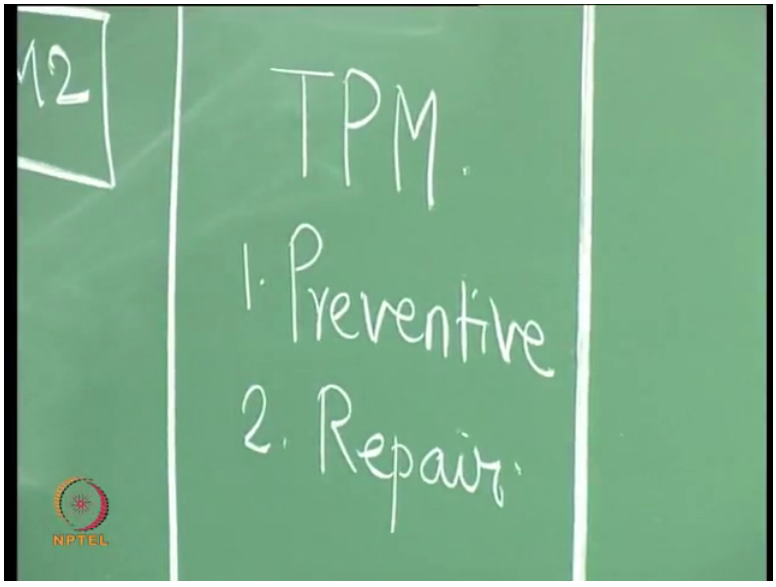

Maintenance of course, is of 2 types 1 is called preventive maintenance and the other is called repaire maintenance, if you own a 2 wheeler or a 4 wheeler it is easy to understand

both the regular service that we send our vehicles for is the preventive maintenance and if it is not functioning we take it for repair which is the repair maintenance.

So, all these machines also have to be taken through preventive maintenance and repair maintenance. So, the emphasis if the emphasis on preventive maintenance is high then the need for repair maintenance will be low because the machine would work well. So, the emphasis on preventive maintenance will be very high a part of the preventive maintenance responsibility will also be with the operators and this would help increase the availability of the machine and therefore, would not or would therefore, would prevent not being able to carry out this because of machine not being available.

So, quality maintenance are extremely important and these systems have a slightly different approach to both quality and maintenance where the operator himself or herself is responsible for a significant amount of work related to quality and related to maintenance. And like in traditional systems here where we would have maintenance department for maintenance crew who will be different from this and they would come and attend on the machines for preventive maintenance.

And repair maintenance in these systems which follow cellular and JIT their responsibility for the operator to take care of aspects such as quality and maintenance is high. The other 1 is to talk about to talk about to talk about suppliers and supplier network

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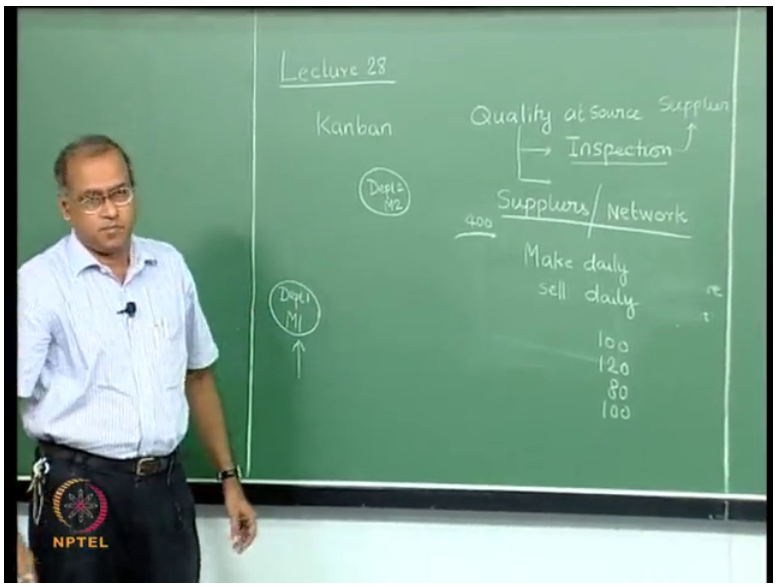

I mean most of there will be a separate slide on supplier in this presentation as we move along, but there is also a lot of responsibility on the suppliers in these kinds of manufacturing systems. We have already seen that the responsibility for quality will lie at the source which means it will be with the suppliers. The second thing is that if we follow a principle of make daily and sell daily if my daily demand or if my demand today is 100 then it is enough for me to get 100 from my supplier. If tomorrow it is 100 and 20 and the third day it is 80 the fourth day it is 100 and so on. Now for 4 days the demand could be 400. Now there are 2 ways of doing it 1 is to get a supply for 400 on day 1 verses supply for 100 120 80 and 100 on every day.

So, if we follow this model where we have 400 supply on day 1 then the amount of inventory that we will be holding will be very high where as if we have 100 120 80 and 100 then the amount of inventory that will be holding will be off the order of 100 where is here the amount of inventory that will be holding will be off the order of 200. In fact, the amount of inventory that will be holding here average inventory will of the order of 50, because the beginning inventory will be 100 ending inventory will be 0.

So, the inventory will be 50 60 40 and 50 which will be 50. Whereas, here the beginning inventory is 400 the ending inventory is 0 the average is 200 per day the average inventory is 50 per day which is roughly 4 times, because we have ordered for 4 days. Now how do we implement it that we are going to order smaller quantities and these smaller quantities come to us at specified frequencies which are shot in the sense daily or half day etcetera?

Now, that is possible on 2 or 3 counts 1 is to have a good relationship identify good suppliers and identify suppliers who will be with us for a longer period. So, identify suppliers for a longer time period. So, that the supplier is willing to observe the slight variation that comes here and the supplier prepares himself or herself to meet daily demand rather than to meet aggregate demand.

Also we have to make sure that the supplier is physically close to the place of manufacturing, otherwise it is not economical for the supplier to send daily quantities daily. There are other ways of doing it which we will see as we move along sometimes the supplier sends a slightly larger quantity, but not directly to the manufacturing the

supplier will borrow some space and area near the manufacturing and then send only the required quantities every day.

So, that take advantage of the transportation, sometimes the manufacturing company itself give space to the supplier called supplier area where the supplier will keep the inventory and the inventory will be charged to the company only when it enters the manufacturing area. All these things necessitated that we have good relationship with the supplier and there will be a network of suppliers for different parts or items that are bought. It is also preferable to have the same supplier giving more items provided the supplier can handle it and the supplier also has to be extremely reliable in terms of lead times lead time is essentially the time taken between placing an order and getting it, now we are going to give a schedule to the supplier there the supplier has to send 100 120 80 and 100.

In the next 4 days the supplier should be reliable and the supplier should not delay these because the cost of every delay is very high and if we do not have a reliable supplier then that would automatically make us build large inventories. And if you do not want to be large inventory is which is a necessary thing in this type of manufacturing systems the supplier should be more reliable. So, that the supplier or the lead term uncertainty does not exist or there is no variation in the lead time from the supplier. Now let us spend some time in understanding the pull system or particularly what is called the Kanban controlled production system. So, let me take a simple example to explain the basic idea in a Kanban controlled system. So, first let us take 1 manufacturing cell.

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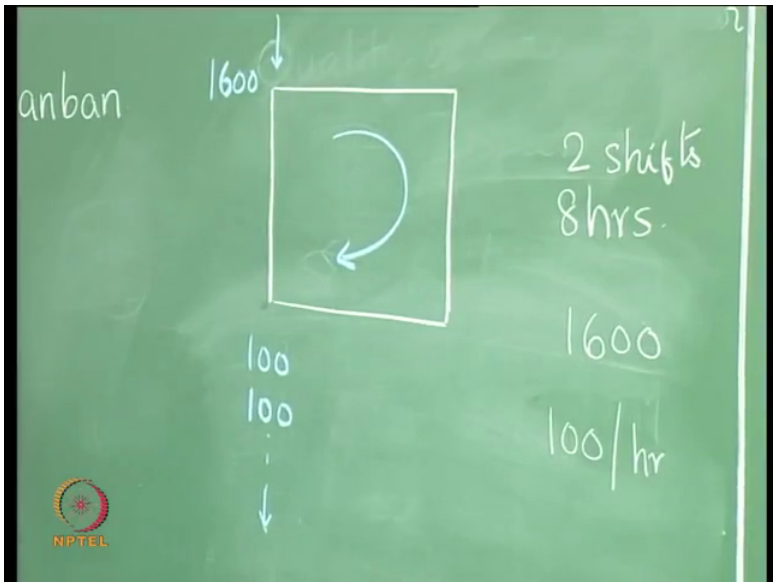

Let us take 1 manufacturing cell which produces an item completely and then we build it as we move along now let us say that we are looking at 2 shifts each 8 hours 2 shifts 2 shifts of 8 hours and let us say that the demand is 1600 we have 16 hours and let us say the demand is 1600 for the day. Let us keep 1 day as a basic time frame we can increase the time frame to 1 week or 1 month we could do anything, but let us keep 1 day as a basic time frame.

Now we will assume that the demand is 1600 per day and there are 16 hours in a day, now let us assume that we can produce 100 pieces per hour. So, if we want to produce this 1600 to meet the days requirement 1 of the things to do is to have 1600 come in at the beginning of the first shift 1600 comes in let us say there is a cell manufacturing cell that has a lot of machines it goes through this process and then 100 comes out each hour.

In fact, if we do not have a cellular kind of a system we have a larger system where a single batch of 1600 is going then it will take a lot of time to make this 1600 in a day, but then we could operate and have 1600 coming at the end of the day.

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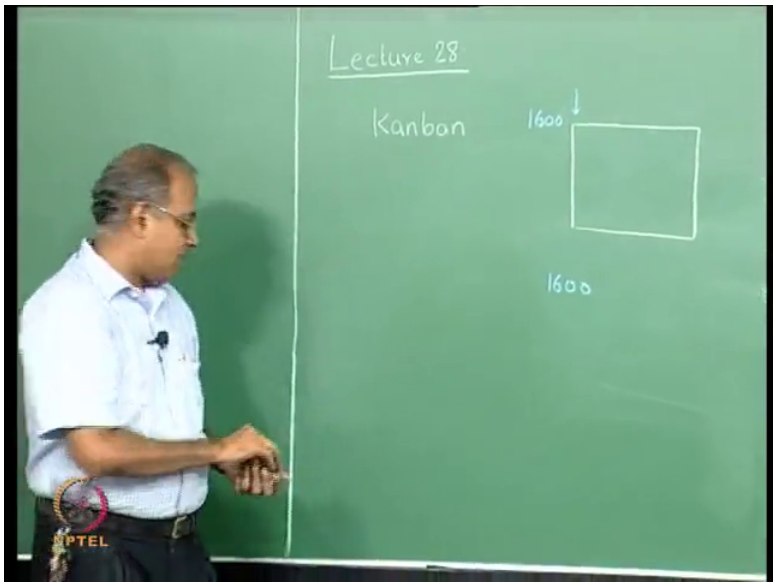

The other way is we have a cellular manufacturing in player. So, 1600 comes in at 8 o clock in the morning let us say which is the first shift and then every hour 100 will come. Now if this 1600 demand at the end of the day if 1600 is to be sent to the customer then there is a finished goods inventory buildup here of 100 which comes out in the first hour and then so on.

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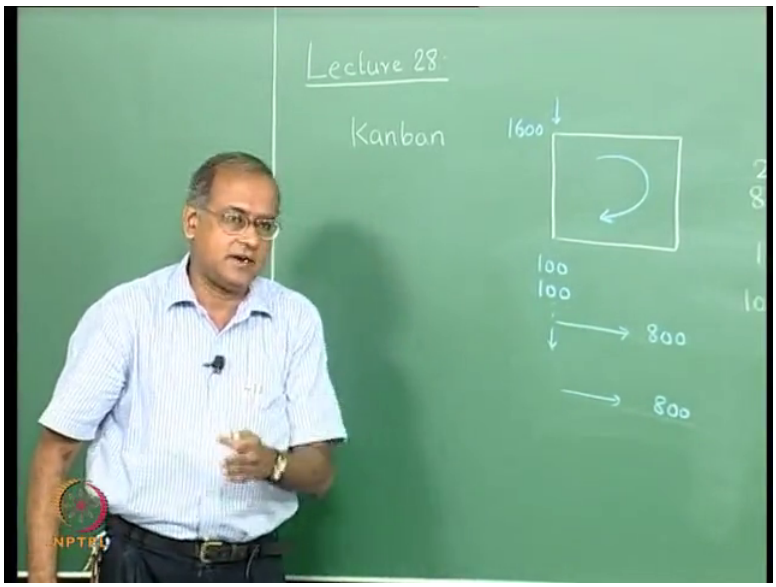

This is would actually help us to give 800 to the customer at the end of the first shift and another 800 to the customer at the end of the second shift provided the customer is

willing to accept 800 at the end of the first shift and 800 at the end of the second shift. So, that the inventory of these items will come down now if we have a system by which the customer is willing to accept 400 at the end of 4 hours another 400 another 400 and another 400.

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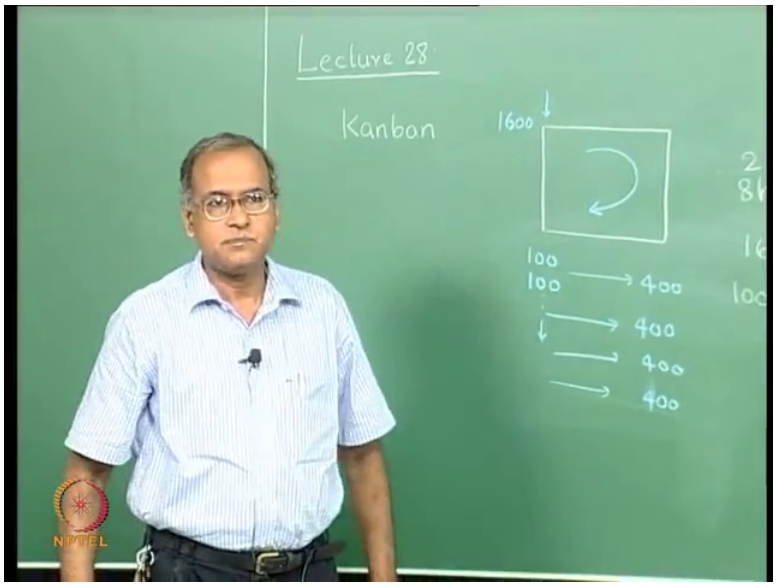

If it is economical to transport 400 at a time 4 times a day then the inventory in the system will come down at the expense of slightly increased cost of transportation then we get into, but the inventory inside this will be 1000 we will start with 1600 in the morning and it will come to 0 at the end of the evening.

So, this will work with average inventory of 800. Now nothing prevents this system from being used because the people who are going to work here are quite comfortable then all the 1600 items are actually available here. Another way of doing it is by saying that I am not going to give all the 1600. Now if after all the production capacity is 100 per hour.

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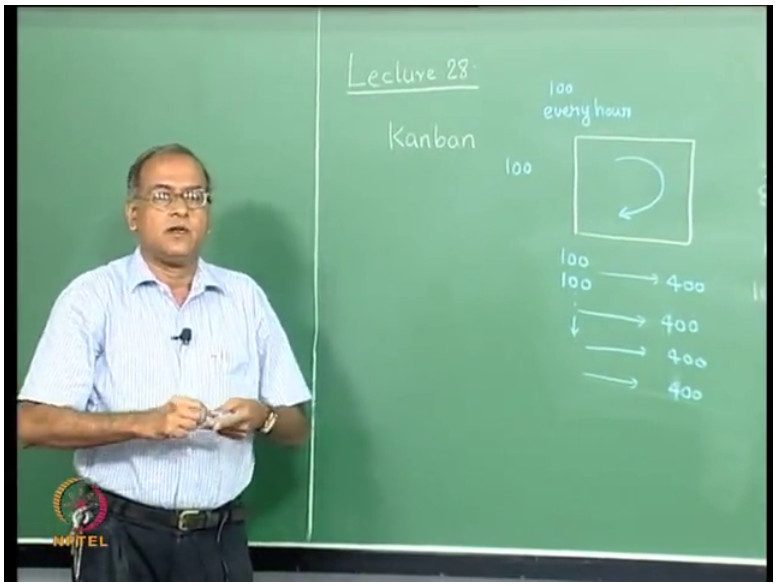

So, I am going to input 100 every hour I am going to input 100 every hour. So, that there is a 100 that will come in at 8 o clock and 100 will come out here at 9 at 9 another 100 will come in and another 100 will come out and so on. So, when we do that the inventory in this system will be 100 as against 800 in the earlier case if all the 1600 comes in in the morning and 0 is in the evening the average inventory is 800 1600 by 2 which is 800 now 100 items come every hour.

So, the inventory will only be 100 in this system and will not be 800 in this system. Now, when we start implementing this system now somebody here can always ask what prevents you from giving 1600 after all at the end of the day all the 1600 are going to go to the customer, this part is not going to be affected this part will not be affected whether we send 1600 or whether we sent 100 per hour.

Now there will always be a tendency to ask for 1600 or to have more inventory here. So, that production takes place in a very smooth manner and a production does not stop for want of items and if we follow this model where 100 is going to come every hour if for some reason there is a disturbance then the production will come to a standstill. So, it is necessary to ensure that when we follow this 100 per hour system it is necessary to ensure that 100 comes exactly at every hour.

Now, how do we ensure that these 100 exactly 100 comes every hour and more than 100 does not come every hour a simple mechanism is this?

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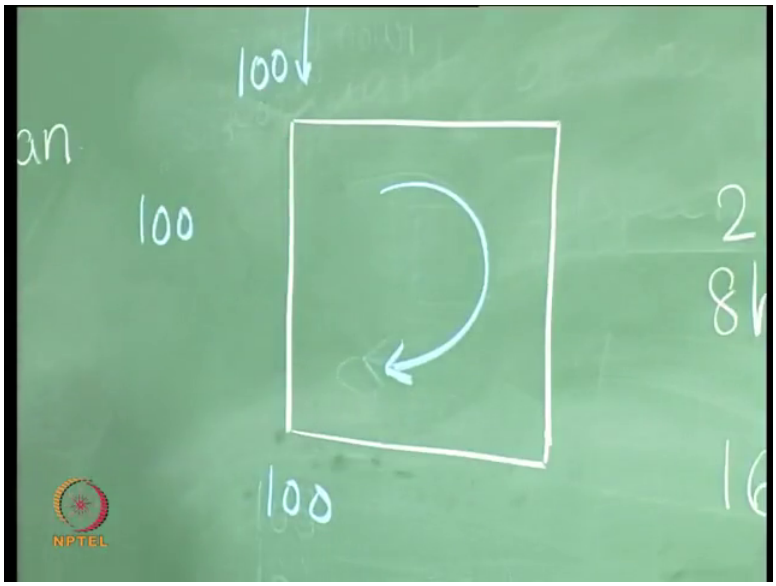

Now, if 100 is over and 100 is coming out 100 is coming out now this 100 goes somewhere this 100 goes somewhere and when this 100 in a in a palette or in a container if this 100 goes somewhere and wherever this 100 goes when a filled container is given here the person will get back an empty container which can hold only 100. So, if the person gets an empty container which can hold only 100 on giving a filled container of 100 which means this is finished goods he gets an empty container which can hold 100 takes this empty container and can get only the maximum filled which is 100.

So, we make sure that exactly 100 is going to come in at the moment for the purpose of discussion we are going to assume that the time taken to give this and get back the empty container and the time taken to go with the empty container and get it filled or given empty container and get a filter container is 0. So, all these can happen at the same instance is our assumption, but then if we about 10 minutes that 10 minutes excess inventory will have to be there in the system.

So, the basic mechanism is that I give this filled container somewhere I can get an empty container I take this empty container back to the input here and either get it filled or return the empty container and get a field container of 100 material from here. So, that will ensure that I am able to get 100 every hour. So, this is a simple mechanism of production control now for some reason if I have now when I do that.

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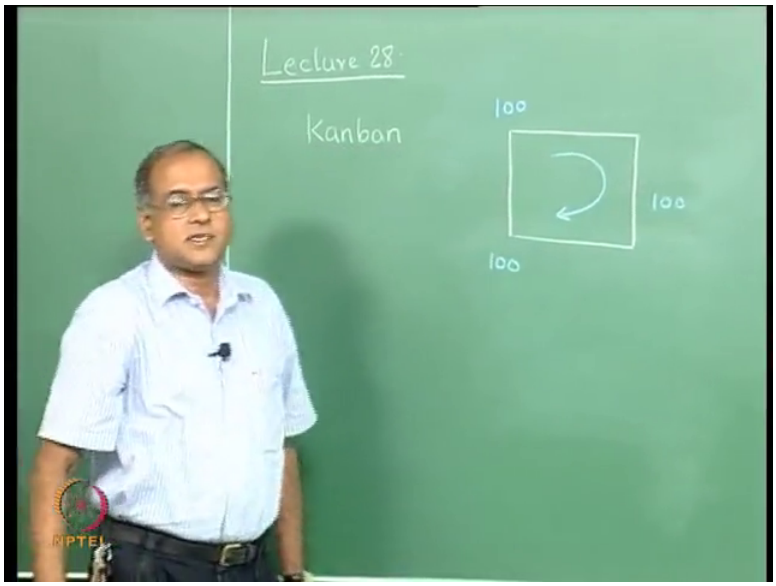

So, now, a 100 gets into the system every hour and 100 gets out of the system every hour now what is the inventory in the system that is 100 now my hourly demand is 100, now I need a container whose capacity is exactly 100, I cannot put more than 100 in it I will only deal with containers and I will not deal with pieces which means if I if I am talking of a container it is either full with 100 pieces or it is empty with 0 I am not looking at half-filled container and so on.

So, it is either free and 0 or it is filled and 100 if it is here the work has been done if it is here the work is to be done. So, only these things can happen now I have an inventory of 100 in this system suppose I want to have an inventory of 50 in this system. So, what do I do I realize a 50 here.

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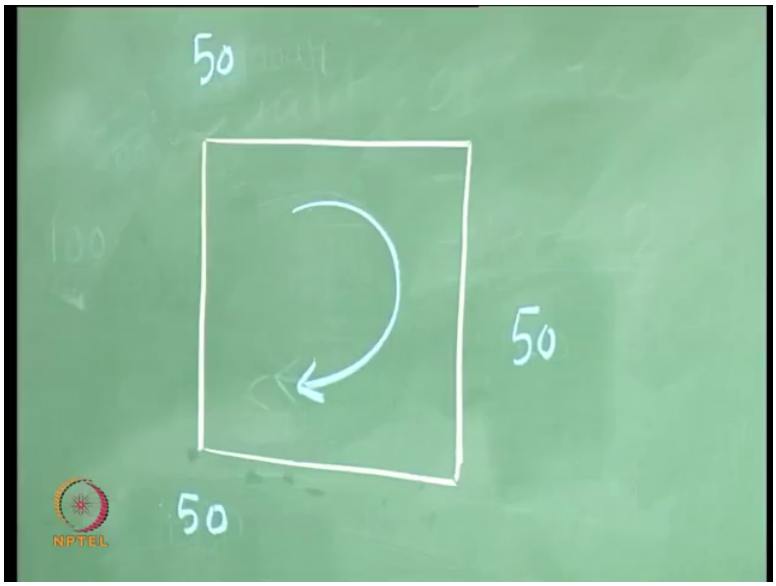

In half an hour this 50 will be completed the 50 will go here a free container of size 50 will come.

And that will be taken here and given and 50 will come here. So, this will happen every half an hour the inventory in this system will only be 50 the output would still be 100 per hour.

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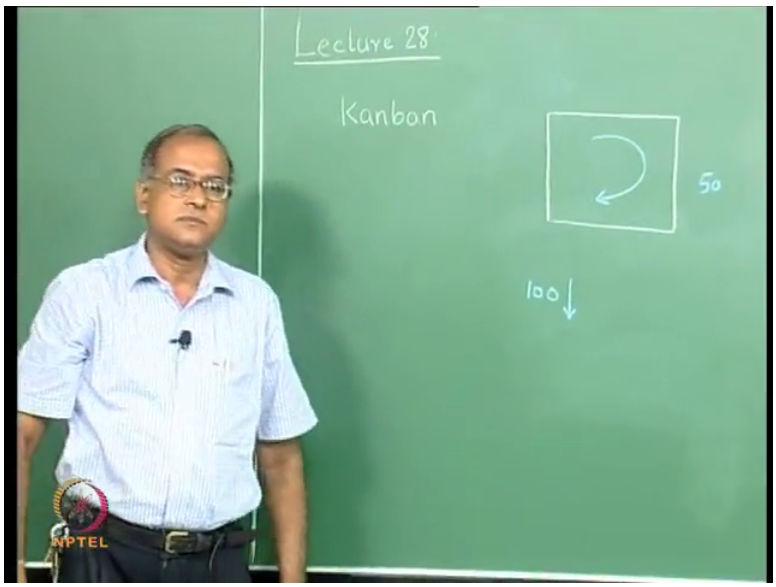

The output per hour will be 2 containers of 50 which are kept here. So, the output is the same 100 per hour that comes with 2 containers of 50 the input is the same 100 per hour

which comes with 2 container of 50, but the inventory in this system is only 50. So, now, if I want to make 25 here I can now do it as 4 containers of 25 per hour 4 container of 25 per hour and so on, but then if I want inventory to be 100 then the way I do this is I will require a container whose capacity 100.

If I want 50 inventory then I need a container whose capacity is 50, if I want 25 I need a container whose capacity is 25, I cannot be creating containers with capacity 100 50 25 and so on. So, what I do is I now go back and say that I will standardize my container size suppose my container size is 10 container sizes 10 suppose my container size is 10.

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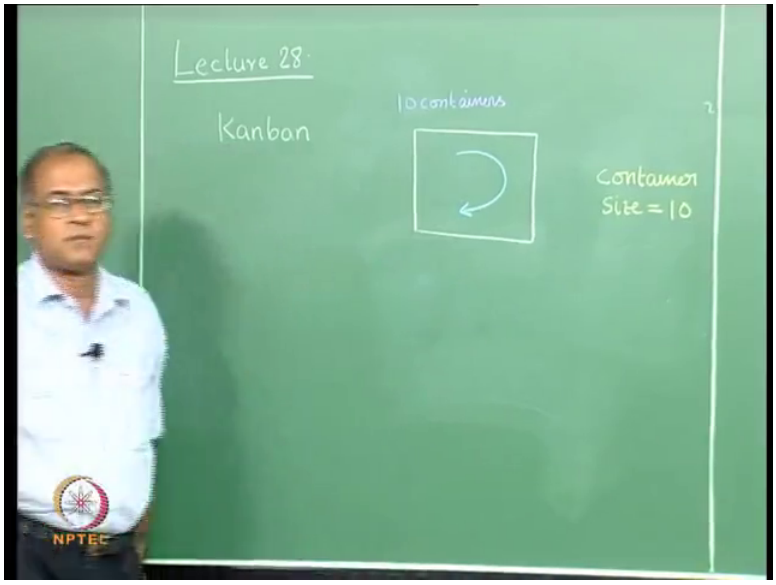

Then if I choose to release I will get an output of 100 per hour, if I choose to release 100 here then I say that I will release 10 containers I will release 10 containers. So, the inventory of 100 will come in. So, all this 10 containers will be here all these 10 containers will go here 100 per hour.

If I want my inventory to be 50, I will release 5 containers.

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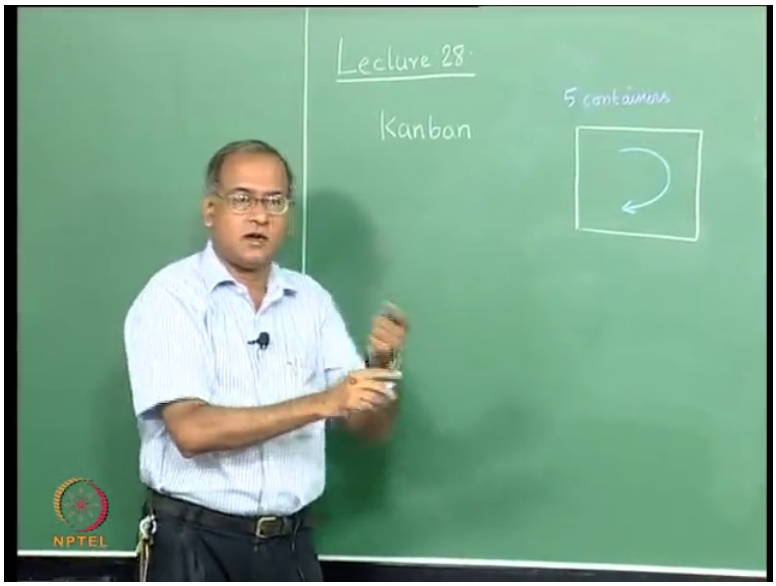

In half an hour the work on the 5 containers will be over all the 5 containers will be given 5 new empty containers will be taken another 50 will be replenished. So, this way I can go up to 1 container.

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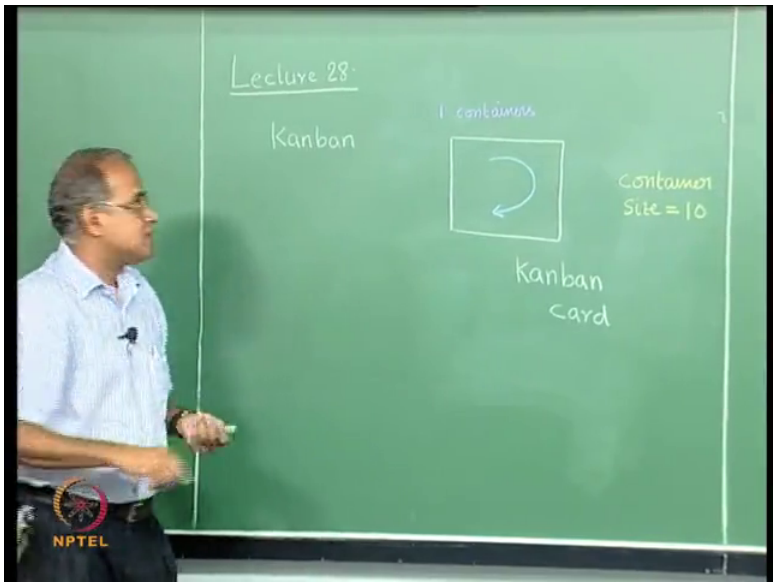

I just give only 1 contain which means I am giving a 10. So, 1 hour I can do 100 6 minutes I can do 10. So, I just give 1 container 6 minutes it is done. So, 10 pieces come out container size is 10. So, 6 minutes it comes out it is given it is replenished and it goes

back another container comes. So, with 1 container of size 10 now every 6 minutes I am cycling the whole thing and my inventory here will be only 10.

So, depending on what inventory I want here which should be in multiples of 10, importantly in multiples of 10, that many container I will go and release. So, depending on when I fix my container size depending on how much inventory I want I decide how many containers should be released now this is the essential idea of what is called a Kanban system; Kanban represent a card. So, why does a card come in? So, far what I have explained is if I have 10 containers coming in then in 1 hour 10 containers will go out and then I said that these 10 containers are physically taken here 10 new refill comes in and so on.

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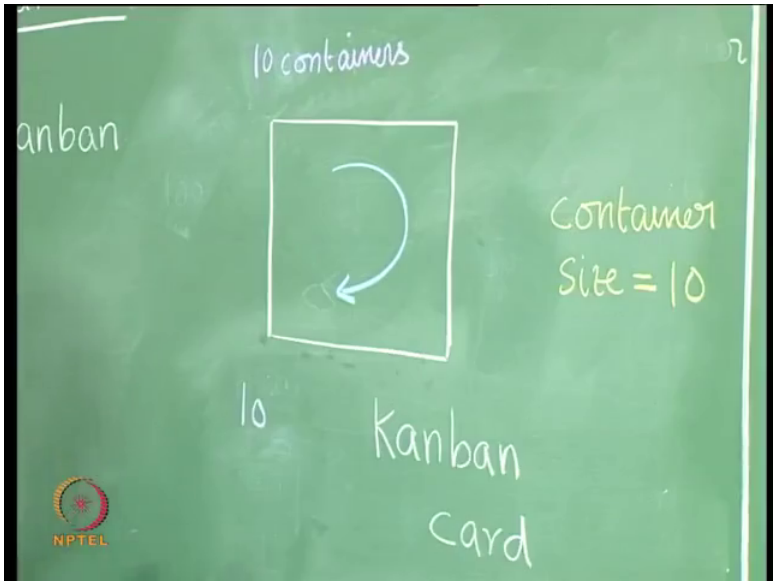

So, 1 other way of overcoming this physically taking and getting a refill and all that can be made by use of a card. So, each of these container will have an associated card which will act as a signal. So, this signal will be to replenished. So, the container would still physically go or for example, when these container are given the cards are taken from these containers the cards go there and if I give 1 card I get 1 container.

So, I just control the number of card that are there in the system, I do not control the number of containers that are there in the system with 1 card I will give 1 container. So, Kanban controlled system is a card controlled system. So, this way I make sure that I restrict the inventory in this system this is the essential principle a Kanban controlled

system. Now let us just expanded to do a couple of things very quickly now let say this cell makes 2 products P and Q.

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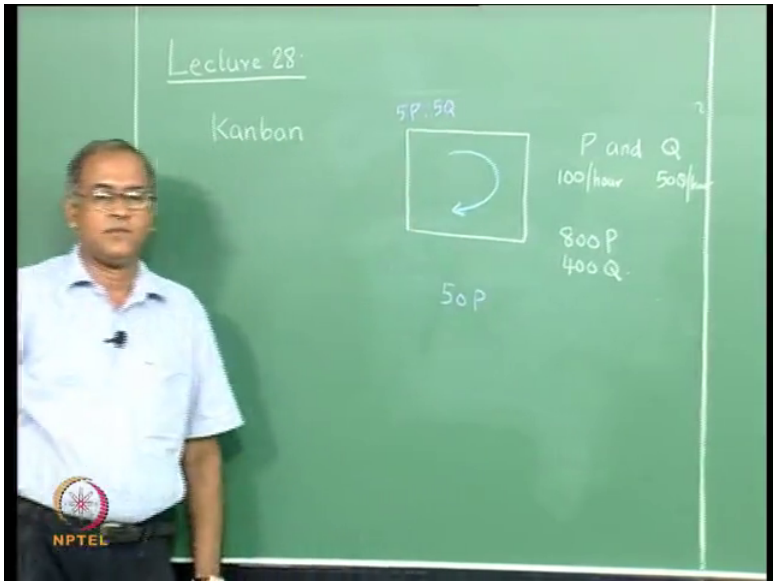

Let us assume that this can make 100 of P per hour and 50 of Q per hour. So, my demand today will be 800 for P and 400 for Q because I need 8 hours to make P and I need 8 hours to make Q I make 50 Q per hour. So, 8 hours make Q. So, now, what I can do is that I start with production of P.

Let me assume that my container size is my container size is 10. So, what I can do is I will realize 5 containers of P. So, in half and hours time I will replenish 5 P which means I would have produced 50 f P. Now after half an hour what do I do now I go back and I release I could release for example, 5 containers of Q, instead of P I can shift the product. So, with the card I go I do not take a P I can take a Q. Now, after half an hour after half an hour I go back and release 5 of Q; 5 of Q is going to take 1 hour for me. So, I cannot do 2 and half container. So, I can do either 2 containers I can do 3 containers if I want half an hour about inventory. So, let us say I do 3 of Q.

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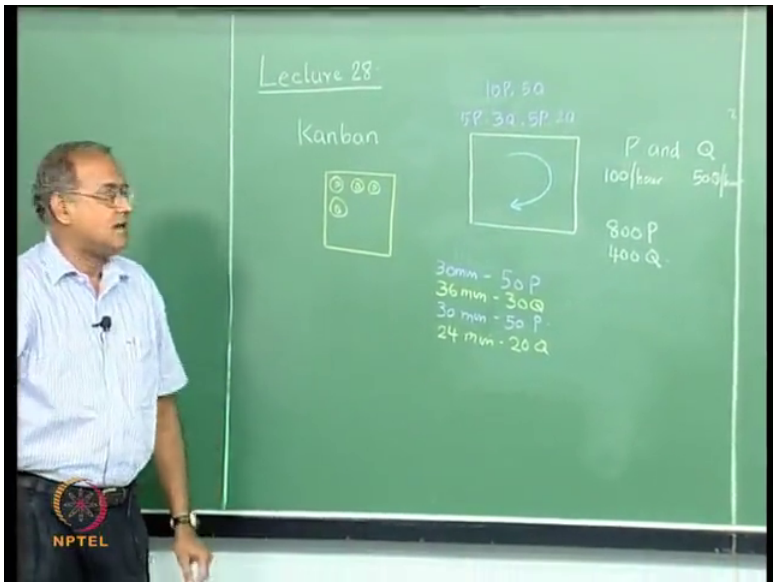

So, I realize 3 containers of Q now these 3 containers of Q will be done at 30. So, 1 hour I can do 50 10 I do in 12 minutes. So, in 36 minutes in 30 minutes I do 50 of P in 36 minutes I do 30 of Q.

So, again I come back and I release 5 P. So, another 30 minutes I do 50 of P now I go back and release 2 of Q. So, that in another 24 minutes I do 20 of Q. So, in 2 hours I can do 100 of P and 50 of Q this is how I switch, but there is a little issue now here the same cell I am changing over from P to Q, Q to P, P to Q and if I want to do P again I have to change from Q to P. So, in 1 hour I will have at least 4 change over now all this is going to take exactly 1 hour. So, of each changed over is 10 minutes then I will require 1 hour 40 minutes to do this.

So, I have to do a couple of things 1 is I have to constantly try to bring down that changed over time from 10 minutes to 5 minutes, if I cannot do that then I will not have the luxury of doing this then I will have to instead of breaking this into 2 break this into 2 I will have to release 10 containers of P I have to release 10 P followed by 5 Q. So, that there are 2 change overs. So, larger change over time will bring larger inventory into the system, when I am operating at 10 P containers and 5 containers of Q at any point and time my inventory is 100 of Q and 50 of Q. If I am able to operate this at study state by average inventory in the system is 50 of P and 25 of Q 30 sometimes 20 sometimes 25 of Q.

So, the amount of inventory that I have in the cell or the amount of control I have in the cell is not dependent on the change over time between P and Q that is the reason if we go back here bullet number 3 will talk about quick setups. So, we are able to have quick setups and the setup is of the order of 5 minutes then I am talking of 1 hour 20 minutes, if the setup is 10 minutes I am either talking of 1 hour 40 minutes or the higher double the inventory and 1 hour 20 minutes, in all my calculation I have made it very very tight by saying that you know my demand is 800 P and 400 Q. So, that in 8 hours I can make 800 I could have make this as something like a capacity to produce 100 per hour.

But a setup of 10 minutes or something like that I could have adjusted this calculation, but the fact is if I have larger change over times I would not be able to bring down this inventory to the extent I can. So, by constantly moving towards quick setup and quick changeovers I am trying to release as small a quantity as I can. So, that the inventory here reduces and I said I can go back and take it by providing a card.

Now in there will be a card associated with each container, in practice it is not exactly done this way now there will be some inventory area which will be here. So, there will be some container of P, some container of Q, some container P, some containers many products which will be there associated either with this cell or a couple of other cells. We will see those things also for example; if the product is not entirely made here if the product from here goes to an assembly from here it goes to an assembly a separate assembly.

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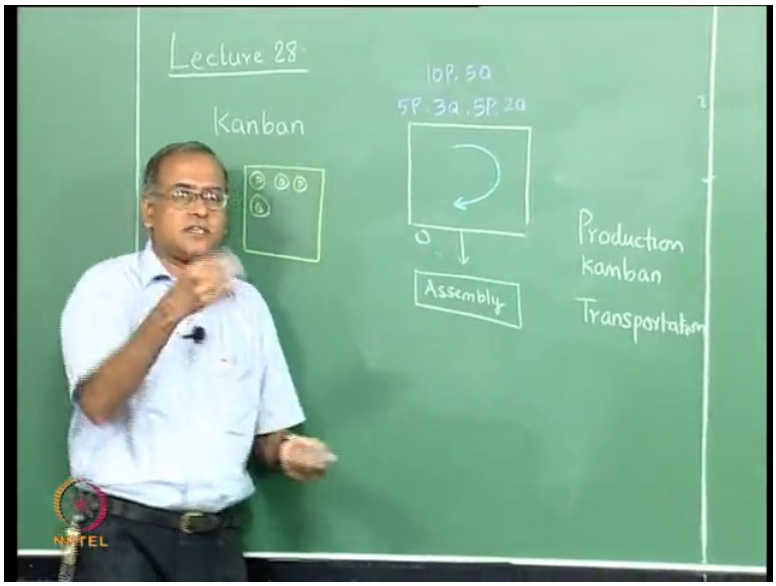

So, as something comes here it is given it takes another card and from this card they will go back and take the other P. So, there will be area as where this will come. So, assembly will come and give it to the finished goods inventory. So, this will be given to the assembly for the card will be taken this card will be brought here to this area and the person will take another P which is to be taken here either 5 PS or 3 QS or 2 QS depending on what is to be taken.

Now in such cases there 2 other things now so for whatever we have seen is if a card comes the card goes here another item comes. So, these cards are called Production Kanban, because this authorizes production. Now sometimes what will happen is there will be specific transporter if the area is far away. So, the production is done and then there will be a production Kanban and transportation Kanban.

So, the transportation Kanban will authorized that this is to be transported here. So, somebody will come and transport it or transport it here then take something bring back the other card then put the transportation and taken it back. So, there will be a production and transportation that is called a dual Kanban system which has production Kanban and transportation Kanban. Sometime the transportation is called withdrawal Kanban. So, withdrawal would mean transport. So, dual Kanban systems essentially mean that the containers are in a area that is slightly away.

So, there will be a production there will be a transporter separately who will do the transportation Kanban. The other example that I give is very tight example. So, both production and transportation is done by the same person and in such cases it is called Single Kanban system. So, your single kanban system verses dual kanban system.

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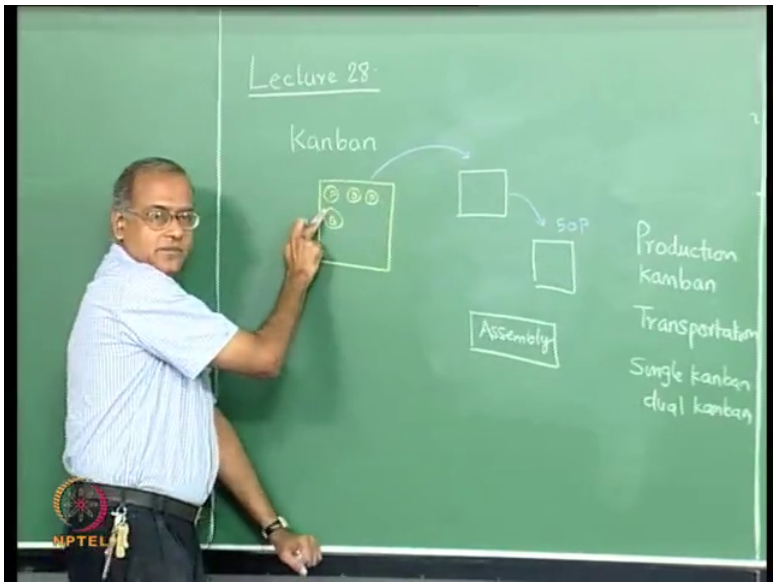

Many times manufacturing system are not as simple as what I have given here. So, you could have 1 cell here, you could have another cell here from there it will go to assembly now these things happens when we have product based manufacturing cells. So, what will happen is 50 P will come here. So, when 50 P is given here some cards are taken those cards are they go here from there these are moved and they will come back from the material to this or sometimes 50 P is finished it would not directly go here it goes back here with another signal that this containers have to go to cell 2.

So, 1 could write in the cards saying cell 1 process completed it will go to cell 2. So, these 50 will not come here it will go here and the person will take another 50 P that should go to cell 1. Now there is inventory buildup of things that should go to cell 2 then cell 2 completes they will now bring put something back here and take what is required from here. So, those there are a small inventory buildup of those that have come out of this and the assembly will now pull them and protects. So, when we follow this kind of a system there is a little more inventory in the system whereas, if we do not have this and we say that this whole thing is.

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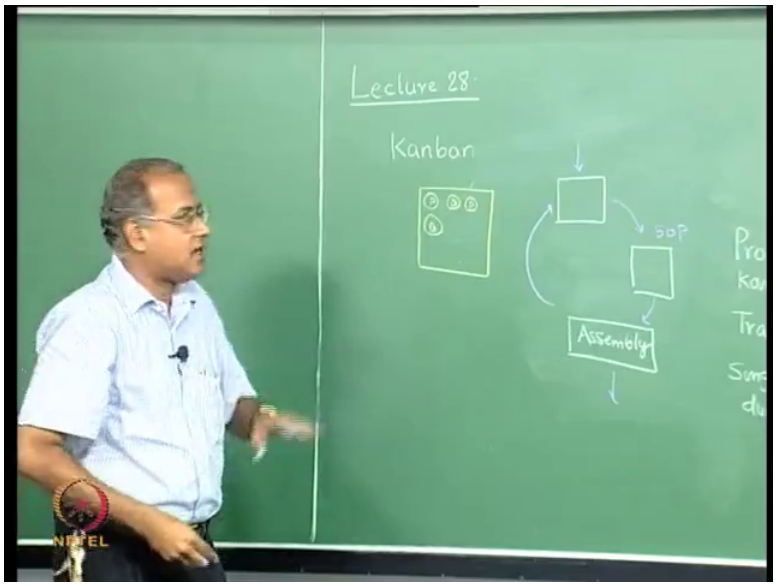

It will come here from there this will go here this will send and the cycle is completed this will be very tight normally this kind of thing is not done, because it will be extremely difficult to maintain something like this unless we have come entirely automated system and so on.

This kind of a thing happens many times, but then this would involve a transporter to transport things also. So, there will be some inventory buildup here and then the inventory will also be replenished this will feed into this and then take something this will come put something take it this will put something here and take it. So, this Kanban area would be full of containers which will have to go to different cells for manufacture, but the essential idea is to control the amount of inventory which is in this by adjust. So, important thing here is to determine the Kanban size or the container size Kanban size or container size.

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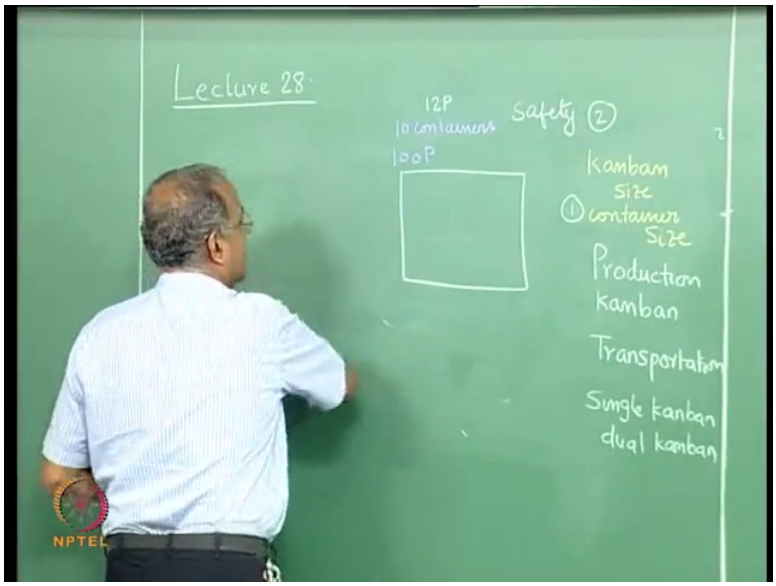

Now sometimes what will also happen is when we go back to this let us say 100 P comes every hour. So, 10 containers; 10 containers come every hour and we want to maintain a 1 hour inventory. So, if 10 containers have to come here it becomes extremely tight to do that. So, what can happen is that we will have a little more inventory. So, instead of doing 10 containers you could release 12 containers to begin with so, but then once 10 container are out here there will be an excess 2 container inventory in the system once 10 containers are out 10 new containers can come in. In between 1 container the processing can begin. So, there is always a little extra inventory there sometimes then we even have a Kanban area.

Now, I am ready with my 10 containers here I go to the Kanban area I realize that I am able to get 10 containers I am able to get only 5 containers. So, what do I do I go back and take 5 containers now they will be an already existing inventory. So, with that there will be 7 containers whose work will begin and after sometime as they finished we can get the other ones replenished and do that.

So, there is also a small safety that is given here system is not very very tight there will be some safety. So, if the hourly inventory is going if a 10 containers are going there if the demand requires 10 contraries, then there will be little more which will represent the inventory in the system and if it is a product that repeat every day then we could use that

excess inventory to meet the next day's demand and so on. So, the question is how much of safety do I give.

So, the first question is what is my container size? And second what kind of safety do I bring into the system. So, these are 2 relevant questions that we will try and answer as we move along the last part is this.

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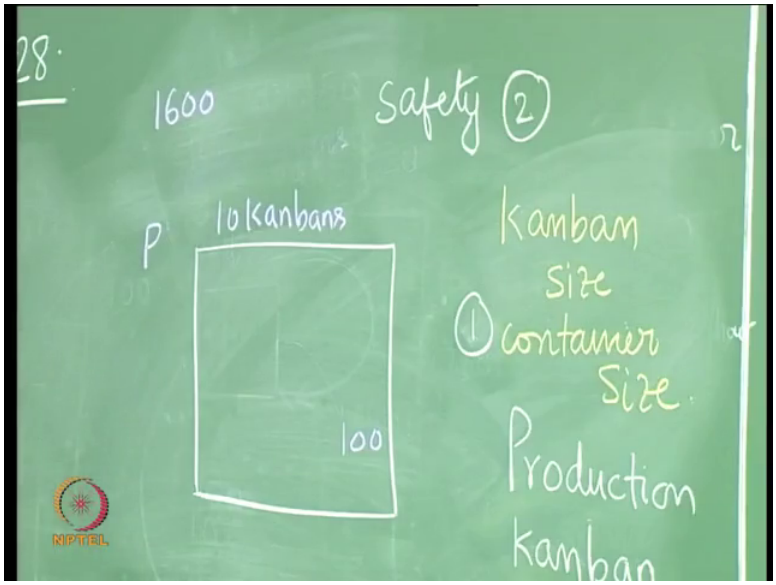

Now if I am doing 1 item which is only P and I am doing 1600 per day, now 1 other thing is if I want to keep an inventory of 100 here I realize 10 Kanbans every hour. So, now, the question is this is coming from outside supplier now if I am having 1600 that is stuck in a store and I am releasing 100 every hour to make sure that my inventory here is 100 the inventory here will be 800, now can I have a system by which my store will get exactly 100 from my supplier every hour now that is difficult because I may need 16 transportation between me and my supplier.

So, first and foremost my supplier has to be physically very close to me and secondly, the cos the supplier should be willing to have 16 transportation every hour. So, that is a little difficult. So, we could think of a way by which we have some understanding with supplier and the supplier may deliver it as either 2 into 800.

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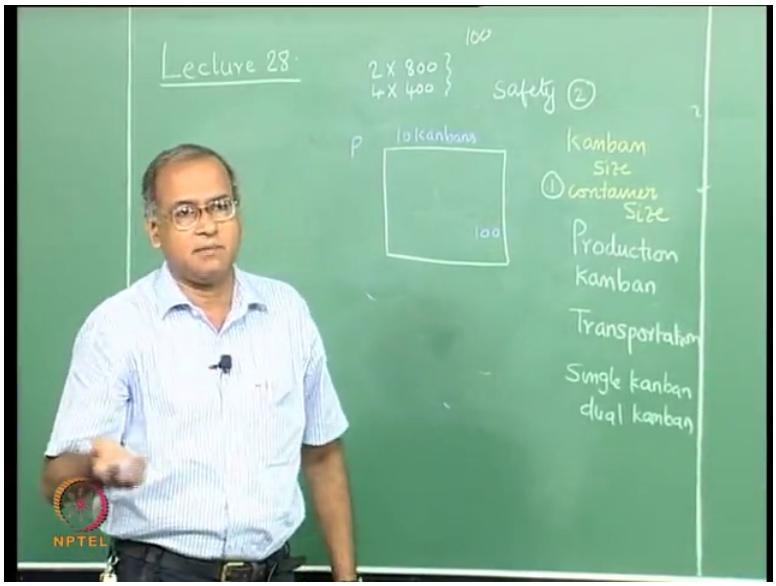

So, that I get 800 in the morning and 800 in the afternoon or with a little bit of in discussion I could do 4 into 400. So, in such cases the containers size will not be 10 between me and my supplier because my container size is 10 then I have to get 80 containers from him if it is coming 2 times a day or it would be 40 as the container is 10 40 containers coming from the supplier.

So, in such cases I define a slightly larger container size and say 100 as my container size here. So, between me and my supplier I will get it in containers of 100. So, I will be operating at 4 containers if I am doing or 8 containers if I am doing this now between this and this, the container size will be 10. So, back again between this and this, the container size could become 100 to the customer so that those containers can get replenished as we move along. So, the container size will be higher between the supplier and manufacturing within the manufacturing cell the container size will be small.

The container size indirectly regulars the amount of invent the container size and the number of countries in directly regulate the amount of inventory that is moving in the system. So, this is essential principle of a pull or a Kanban controlled manufacturing system, when we actually implemented there would be a few differences between what we have seen here and the way it is implemented.

Now rest of the aspect of just in time manufacturing, and some models related to implementing JIT or just in time in practice we will see in the subsequent lectures in this course.