Operations Management
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Lecture – 48
Total Productive Maintenance

[FL] Friends welcome to session 48 in our course on operations management and as it is very clear to all of you currently we are in tenth week of our discussion, and we have trying to see to understand the processes, the approaches, the philosophies which can help us to better manage our operations. And one of the important techniques is the total productive maintenance.

Now, in the previous session if you remember we have seen the total quality management and prior to that we are try to understand the concept of quality. Now how these things are interrelated and how these things are important from the point of view of operations management we can see that why we are doing the operations, why we are doing the business activity in order to produce some tangible outputs and these outputs have to be of good quality then only the company will survive in the market, then only the company will grow in the market.

So, the quality of our products and services is very very important and as operations manager it becomes our responsibility, we are accountable for that that we are producing a good quality product.

Now, in order to produce a good quality product our operations must be smooth, our operations must be very very effective, they must be efficient, they must be productive whatever activity we are doing must reflect in the quality of our product. And we have seen that the concept of total quality management is a plant wide, organization wide factory wide concept. It is not a maybe local domain concept or may be specific to a particular department.

So, all people should have this culture of ensuring quality of whatever activities they are doing or whatever operations they are conducting or whatever inspections they are doing. So, the quality culture is very very important in any organization.

Now, coming on to the total productive maintenance; Suppose we have a set of 50 different machines which are working on a particular product. If maybe some of the machines are under breakdown or are under maintenance the overall system performance will suffer. So, we have to ensure that all our machines and equipment are up and running as per our planned production schedule.

So, if some of the machines are not functioning properly, our productivity will definitely suffer. So, we have to ensure, we have to make it possible that we do maintenance of our machines at regular time intervals whatever is prescribed for a particular machine. So, that the process is smooth, the operations are continuous, our production is continuous and we are able to produce a right quality product at right time in right quantity as per the customer requirements.

And therefore, the total preventive maintenance is one such strategy which will help companies to evolve a better maintenance policy or a better maintenance schedule which will help the company in ensuring that all the machines are up and running as per the requirement, as per the plan and that company produces the products to satisfy the customer demand.

So, we will try to understand in a very brief manner the concept of total productive maintenance, because we have allocated 30 minutes of discussion maximum on total productive maintenance. So, they will have a overview of the concept of TPM and much details are possible in this particular concept. So, I will just introduce you to the concept and all the learners can see that where all they can progress what all they can study in further detail in order to clearly understand the concept of TPM in order to have a good grasp over the concept of TPM.

So, let us start our discussion.

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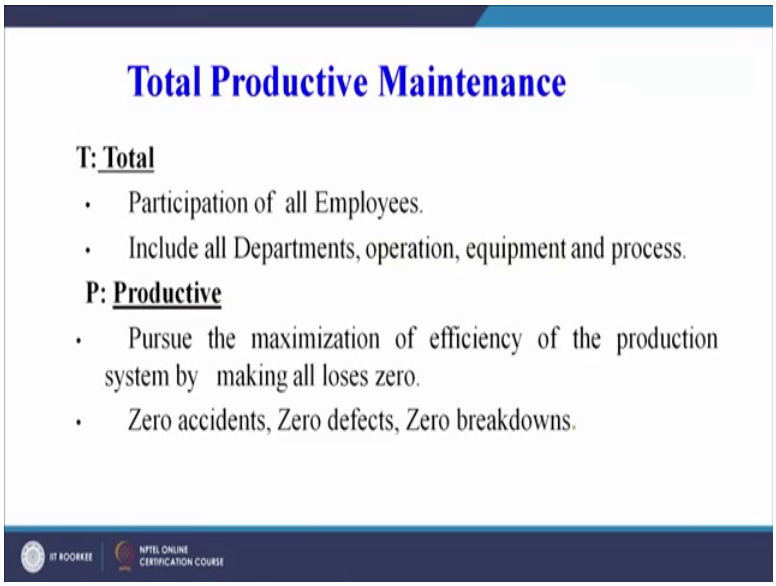

So, total productive maintenance you can see first thing is total that is participation of all employees. As we have seen in total quality management also that word total means participation of everybody involved in the operations, everybody who is a part of the organization. So, it includes the whole, it includes everybody includes all departments operations equipment and process. Then coming on to productive which means pursue a maxim pursue a maximization of efficiency of the production system by making all loss losses as 0.

Now, what our losses may be we can say that accidents must be 0, defects in the product must be 0 breakdown of the machine must be 0. So, total means everybody is involved productive means that we have to ensure that our defects are 0 our accidents are 0 our breakdowns are 0. So, total productive maintenance total and productivity we have understood and maintenance we it is our endeavor to improve the efficiency of the equipment.

So, maintenance means that the entire lifecycle of the production system is under our investigation under our maybe purview and we have to ensure that for the entire lifecycle of the system the system is up and running.

Barring the schedule maintenance activity, when we stop the process and we do some maintenance is not only to repair and maintain the machines.

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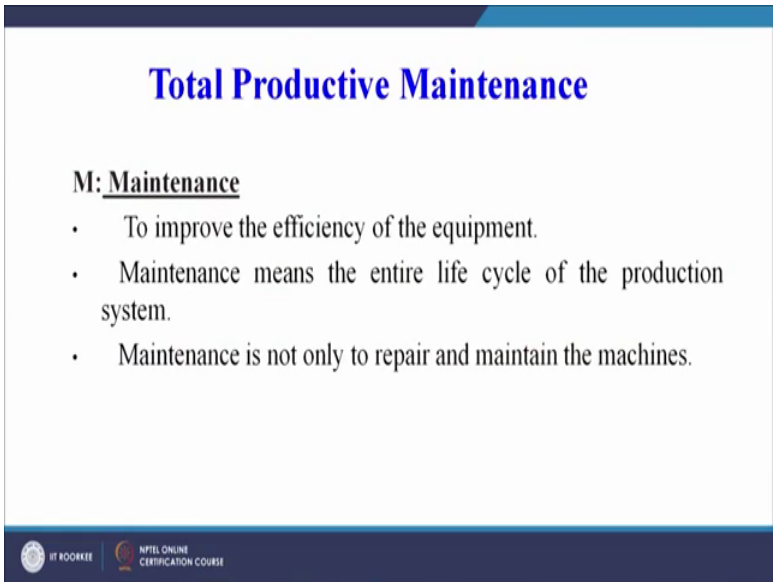

But it also has to ensure that the machines are running during their actual production activity.

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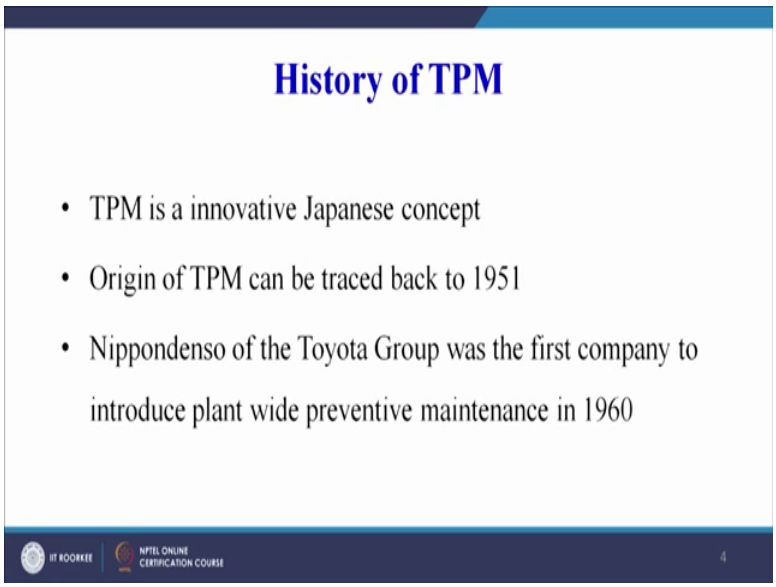

So, we have seen that total productive and maintenance are the three things that make up this concept of TPM that is total productive maintenance.

Now, history of TPM; TPM is an innovative Japanese concept or reason of TPM can be tracked back to 1951. So, Nippondenso of the Toyota group was the first company to

introduce plant wide preventive maintenance in 1960s. So, this is just a brief history now let us define the concept of TPM what is what actually TPM is.

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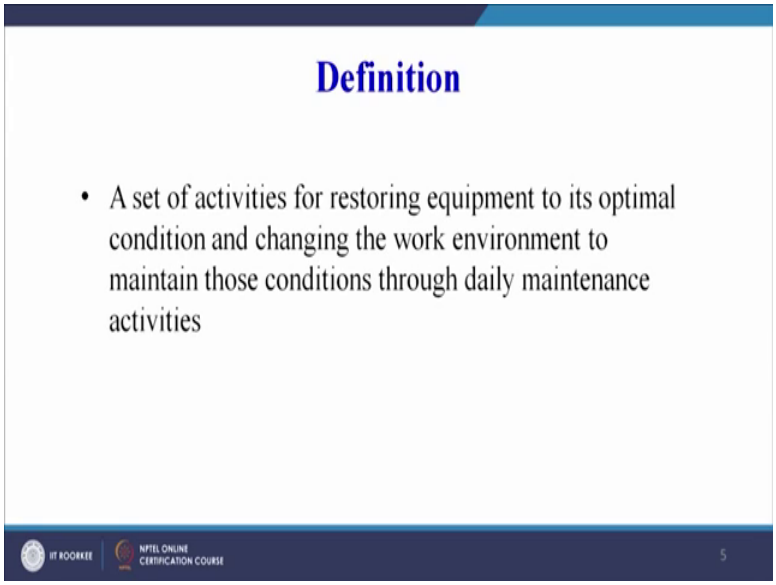

So, TPM is a set of activities. As we have seen the total quality management is a process it is an approach similarly TPM that is total productive maintenance is a set of activities now what is the aim of these activities? For restoring equipment to its optimal condition, and changing the work environment to maintain those conditions through daily maintenance activities.

So, basically these are the activities which ensure that the machines are working as per the plan. So, there is no breakdown of the machine, there is no accident because of the breakdown of the machine; So, all that has to be ensured their set of activities for restoring equipments to optimal condition or optimal operating conditions. So, we have to ensure that whatever are the optimal conditions or optimal operating conditions for the equipment, we have to ensure that that machine operates under those conditions only.

Now, how that is possible that is possible if we maintain them as per the schedule, similarly changing the work environment to maintain those conditions. So, we have to see that how we can modify our environment to ensure that the machines operate at their optimal conditions or the equipment operates at their optimal condition through daily maintenance activity.

So, sometimes we may for some of the machines we may go for daily maintenance, for some of the weekly maintenance if there is a big plant, we may go even for a half yearly maintenance activity also; So, all that is scheduled maintenance as per the standard operating procedure.

As soon as you buy or you set up a big plant for example, a cement manufacturing plant. So, it may have its maintenance policy that how each, and every equipment after how much time and equipment has to be serviced and equipment has to be brought under maintenance.

Similarly, for a thermal power generation plant, there will be a maintenance policy for each and every equipment for boiler for turbine whatever are the constituents of that big system, there will be a maintenance policy for each and every see a part of that system and which will be scheduled as per the standard operating procedure as per the maintenance policy being followed for that plant. So, here that policy has to be followed in principle has to be followed religiously. So, that we are able to keep our system up and running.

Now, what are the objective, why do we need to focus so much on these maintenance activities why? Because we want to increase the production while at the same time increasing employee morale and job satisfaction.

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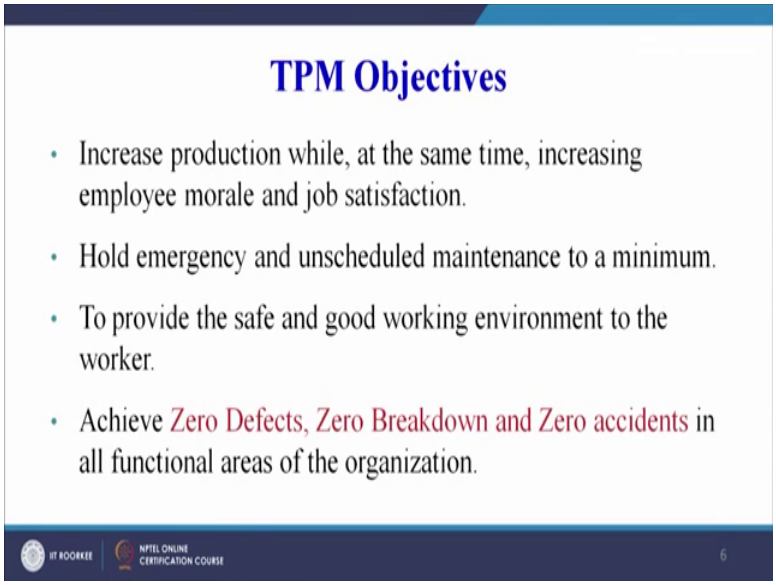

So, we have to ensure that the machines are up and running our production increases at the same time the employees are also happy, their morale is high and they are satisfied with the jobs that they are doing.

Hold emergency and unscheduled maintenance to a minimum. As I have already been highlighting that each and every industry will have a scheduled maintenance policy see. So, TPM objectives are if we are following the TPM our objective is that emergency and unscheduled maintenance activity must be reduced to a minimum or we can say that must be 0. We must only follow the scheduled maintenance policy which has been laid out for the organization.

Another objective is to provide the safe and good working environment to the worker. As well as what we have already seen the TPM objectives are to achieve 0 defects, 0 breakdown and 0 accidents in all functional areas of the organization. So, it has to be ensured that there is no accident happening because of the breakdown of the machine or because of the breakdown of an equipment, that defects are 0 because sometimes the product that we are manufacturing may be defective because the machine is not operating properly.

So, that also has to be ensured because indirectly it will affect the quality of the product also in. In fact, I must say directly it will affect the quality of the product and the accidents have to be minimum.

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Now involve of people at all levels of organization as we have already seen in case of total quality management, similarly in total productive maintenance also we have to ensure that the concept or the activities involve everybody in the organization. So, form different teams to reduce the defects ensure self-maintenance to fulfill the regulatory compliances.

So, maybe if we are operating for example, and rope way maybe from one station to another station, there will be a regulatory order that every month you have to check all these important installations and make a daily report or make a diary that these things have been checked and found well in well under the operating conditions or operating environment.

So, you have a diary or you have to manage logbook in which you will enter all the vital parameters, for the important installations used for operating an rope way. So, there are regulatory compliances, which will enforce a company to go for total productive maintenance.

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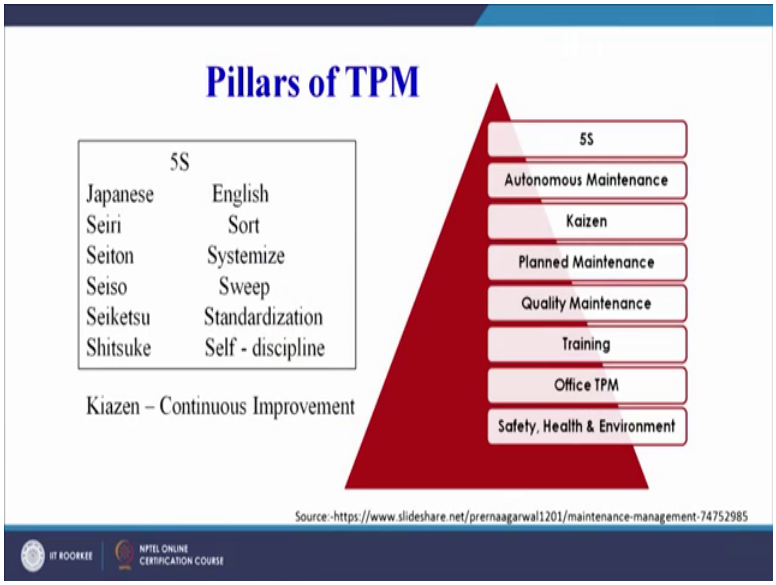

Now, there are eight pillars of total productive maintenance on the right hand side you can see the taken from the slide share, five as autonomous maintenance, concept of Kaizen planned maintenance, quality maintenance, training, office TPM, safety health and environment. So, if we maybe build a strong foundation, if we are strong in these eight pillars our systems will not have to undergo unscheduled or accidental

maintenance. Our systems will be maintained under scheduled maintenance activities only and the system will be highly productive and will be having the continuous production, which will help the company to make a lot of profit. So, here we can see eight pillars we can take into account.

So, friends it is difficult to explain all these important aspects in context of TPM in a very short duration that we have with us, but 5S and Kaizen are the two important topics which are covered in most of the UG curriculum. So, we can see that five s is the Japanese terms, which are [FL] and here we can see the English meaning of these five terms. In English this means sort, systemize sweep standardized or standardization and self discipline. So, 5S also is one of the important pillars of total productive maintenance.

Similarly, Kaizen means continuous improvement, which we have already seen in case of total quality management; that we always we have to strive for improving our systems our processes in such a way, that we are continuously improving the quality that we are offering to our customers. So, Kaizen and five s we have seen that these can help us to ensure the implementation of TPM in our organization.

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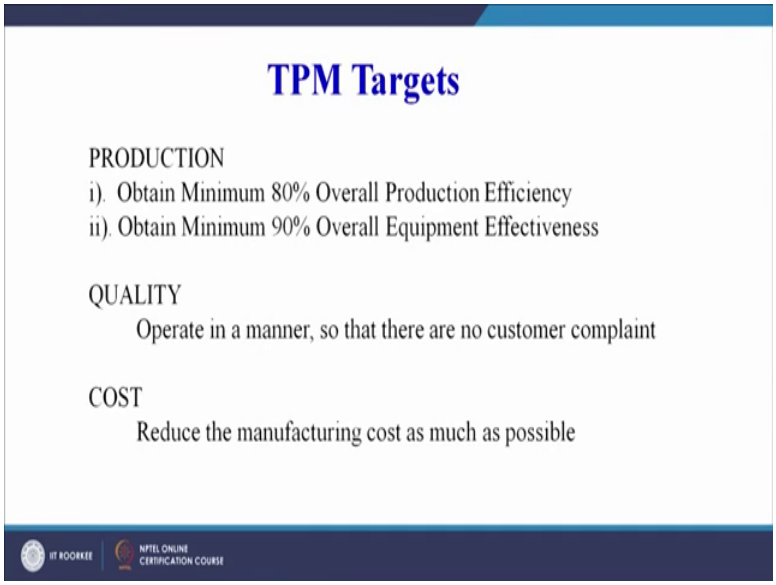

Now, what can be a TPM targets? The targets can be obtained minimum 80 percent overall production efficiency, obtain minimum of 90 percent overall equipment effectiveness from quality point of view operate in a manner. So, that there are no customer complaints. So, we have as I have already told you that that quality of the

product is directly proportional to the maintenance of our machines and equipment. If our machines and equipment are not properly maintained the quality that we are producing may not be as per the desired specification or we can say the conformance to specification will not be honored. So, therefore, the maintenance of equipment is equally important from the quality point of view.

Similarly, the cost from cost point of view the target of TPM is to reduce the manufacturing cost as much as possible. So, if there is avoidance of unscheduled maintenance if we can avoid the accident, if we can avoid the unscheduled as well as the may be unnecessary maintenance activity for the equipment, we can definitely save lot of cost and which will help us to be more productive from the economical point of view.

So, we can see the production from the production point of view obtain minimum 80 percent overall production efficiency and 90 percent of overall equipment effectiveness. So, we have to see this is the percentage is given in terms of efficiency and effectiveness.

So, we can say that production efficiency 80 percent means that we are able to achieve our targets, at least at least it is given minimum 80 percent it can even be higher and our target can be maybe sometimes higher as high as 90 percent of the production efficiency.

Sometimes one of the targets even can be that we have to give a rest to the machine so, that we are able to operate effectively and efficiently with a break to the machine and after the rest period for the machine, we feel that the machines maintain machines wear and tear can be minimized.

But on the contrary we have to ensure with the schedule maintenance of machines and equipment, we even that during the lunch time also the machine may be functional and operating. So, that also that is our target that we can ensure we must ensure that the machine is available for producing the products.

And in order in maybe we can say in subsequent to that we can say that further improving our production efficiency. So, if we can even ensure the use of machine for the maximum period of time by the planned maintenance of our production efficiency can further be focused upon and can be improved in many cases.

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Now, from delivery point of view, we have to achieve 100 percent success in delivering the goods as required by the customer. From safety point of view our target must be that maintain an accident free environment. From multitasking point of view developed multi skilled and flexible worker.

So, we can see that TPM targets is TPM is not only focused on reducing the maintenance activity within the organization, but TPM is focused on improving the production improving the production efficiency, improving the equipment effectiveness ensuring the quality minimizing the cost, ensuring delivery, ensuring safety as well as ensuring multitasking of the worker. So, it has got wide dimensions where the TPM has got its footprints.

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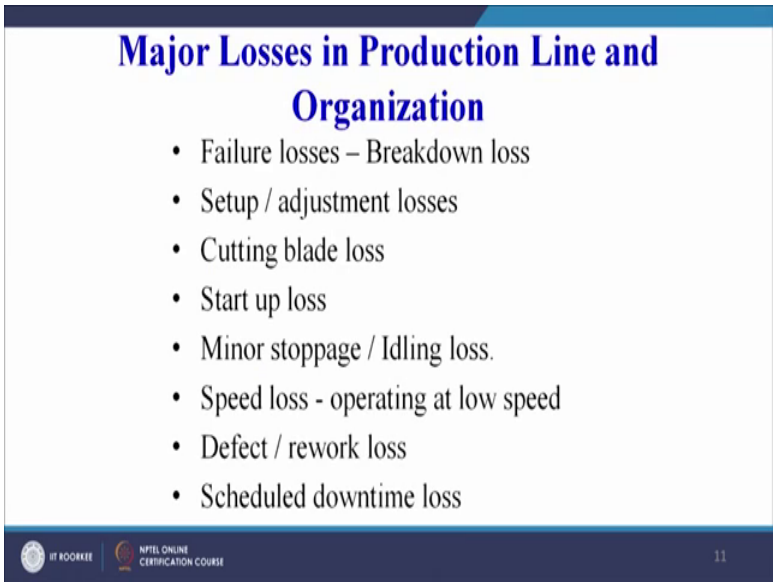

Now, what we can see is the major losses in production line and organization. So, we can see first and foremost is the failure loss or the breakdown loss. Every company want each and every machine to be working barring the scheduled maintenance part because everything requires maintenance. If we take an example of human body human body also requires maintenance, we sleep in the night and work during the day; many times people go out for vacations just to give relaxation not only to the mind, but also to the body. So, every working machine requires some kind of maintenance.

But the maintenance must be a scheduled maintenance we decide when we have to go on the vacations. It is not something accidental. So, accidental maintenance where we are forced to stay indoor that has to be avoided. Because somebody has fallen ill he has to stay at home for five days. So, that cannot be called as a planned vacation, it is accidental vacation similarly for machines also there will be a planned maintenance where the machine will not be working and everything all the maintenance activity related to that machine will be done.

On the contrary, there can be accidental maintenance where the machine has broken down or machine is not functioning properly and the people involved from the maintenance department are working on the machine to make it up and running.

So, the first type of loss is that all of a sudden the machine breakdowns and is out of order and is not producing thereby affecting the production efficiency of the production

line; Setup and adjustments losses, cutting blade losses. So, suppose while operating the blade breaks down maybe it is all kind of a loss it is broken, startup loss minor stoppage idling losses speed loss the machine is not operating at its optimal speed what is at operating at a lower speed, because has not been maintained properly defect or rework losses are there schedule downtime, losses are there yes that has to be there because it is a scheduled maintenance.

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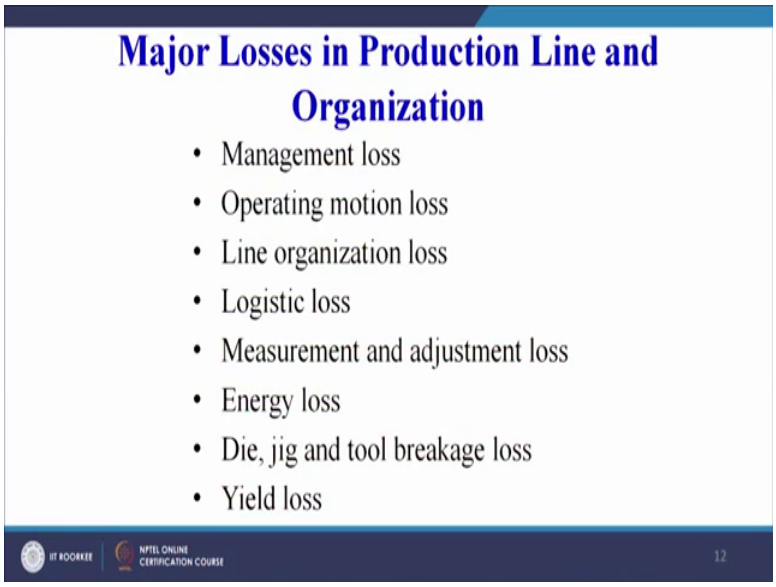

Management loss, Operating motion loss, Line organization loss, Logistics loss in measurement and adjustment loss energy loss; So, there is a long list of losses in the production line and organization.

So, our target of total productive maintenance is that we have to ensure that, these losses are to a minimum possible extent or they lead to minimum possible breakdown of our production line.

So, we have to ensure the minimization of these losses in order to make our organization better a better organization and efficient organization or successful organization, profitable organization. So, if the losses are under control the organization will automatically be successful.

Now, how we can do this? We can do this with the help of the concept of total productive maintenance because if we apply the concept of TPM we will definitely get number of benefits.

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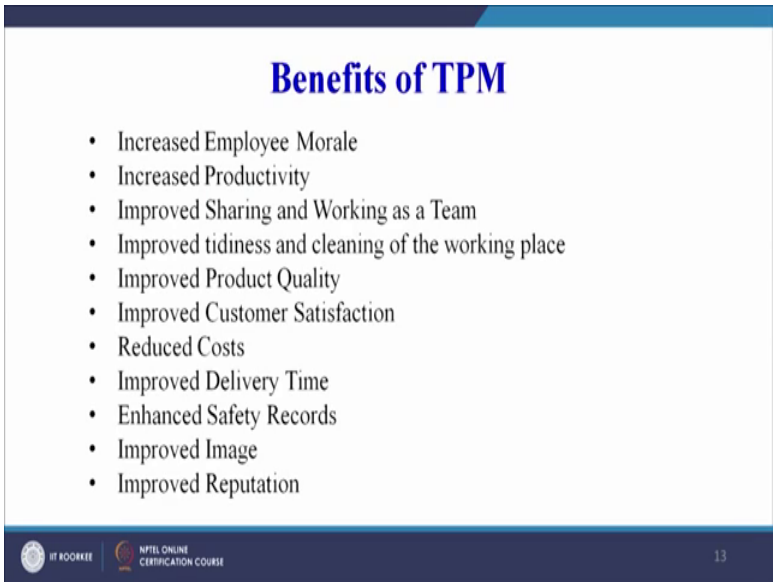

So, we will have it will lead to increased employee morale increased productivity how it will lead to increase productivity? When all the machines are up and running the productivity will definitely be higher. There is no unscheduled maintenance there is no accidental or breakdown maintenance. So, the productivity automatically is going to be higher.

Similarly, improved sharing and working as a team because as we have already seen that this concept is a companywide concept, it is not a individual machine specific concept. So, it will develop the maintenance will be a collective responsibility of the team. Improved tidiness and cleaning of the working place if you ensure that under TPM activity, the overall benefits are will be there for everybody to see improved product quality if machines are operating under their optimal conditions they will definitely turn out a good quality product.

Improved customer satisfaction; So, if you are offering a good product to a customer he will definitely be satisfied, cost will be less improved delivery time and hence safety records which means the accidents will be less if the machines are maintained properly

improved image. So, the brand image of the company will improve and the reputation in the end of the company will improve.

So, in nutshell to summarize what we have tried to cover today is, that when we are managing our operations maintenance plays an very important role. And this maintenance must be total productive maintenance it must be everybody's responsibility the maintenance policy of the company must be valid out, we have to maintain a logbook for each and every maintenance activity within the organization, we have to check any unplanned or accidental maintenance.

So, that that is brought to be minimum zero risk, zero defect may be zero actually to breakdown. So, we want to ensure that the total productive maintenance concept, the philosophy the activities under TPM must be religiously adopted and followed. So, that we derive all the benefits that are listed on your screen.

I do understand that in the brief 25 to 27 minutes period that we have covered this topic, it is not adequate. So, in order to have better understanding of the concept of TPM, I would advise readers to read the text that is available on internet or look for good text books on maintenance and maintenance strategies and try to grasp the concept in much more detail.

Because the actual policies, the pillars of TPM whatever we have seen today everything needs to be understood in much more detail; in much more depth in order to control the maintenance policy, in order to control the maintenance activity of an organization.

So, with this we close the today's session.

Thank you.