Farm Machinery
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Lecture – 55
Machinery for Land Drainage,
Land Reclamation and Estate Maintenance Part – I

Dear students welcome to my lecture number 55 in the series of NPTEL lecture on Farm Machinery. Well today I have brought to you the machines which are used for land drainage, land reclamation, and state maintenance. Well you may find that this is a machine, this is a lecture which particularly deals with the machines which are not exactly in the in the field to a great extent. But to a greater extent on reclamation because many times it is required that there is a land which is either bare land, or a land which has not been used for long duration. And we would like to reclaim that land for vegetation or for any other requirement even for creating a park or whatever.

So, whenever we need such requirement I think agriculture engineers get pressed into service. And I think it is very essential for an agriculture engineer to have an idea about such machines which are available. In some of the books you may not find this particular chapter.

But in some other books you will find that this is a relevant thing which as an agricultural engineer one must have a look at it. Now well this lecture has been divided in two parts. So, part 1 the machine part 1 I will be talking today. Let us go by these slides which we have prepared for you.

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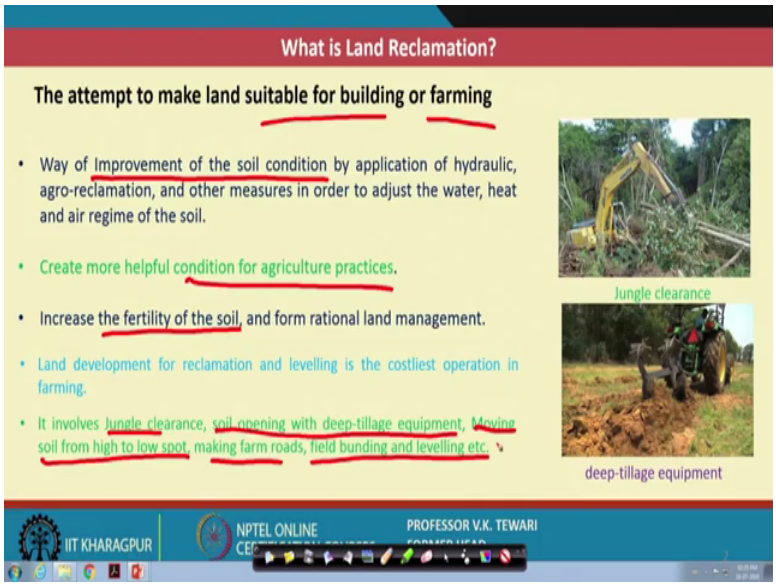

What is land reclamation? It is very essential to know what it is actually although you may find various definitions various write-ups and all that I have brought some write up for you here. Because once I speak and then each time you have to listen to the lecture.

You would also need some sort of a material or nodes which will be helpful for you for carrying things for a longer duration of time. And to understand the whole concept of what this land reclamation means.

Well the actual what exactly we are trying here is improvement of the soil condition; see what happens is that the condition of the field may be let us say the condition of the field may be that it is totally a stony land. And a lot of bushes etcetera have grown up for a long time it has not been used either for cultivation or for something else.

So, that land needs to be improved upon for a given purpose. So, how do we, what are the things that we need in reclamation? Why do we need whether we want for farming operation or we are interested in creating a suitable building, infrastructure maybe a school or maybe anything that we can think of.

So, for all this the attempt is to make land suitable for these things, that is what land reclamation means. Sometimes you would also like that the land should be made from fertile and that also comes into land reclamation by using some sort of a chemical etcetera.

Now, here the way of improvement of the soil condition by application of may be hydraulic, agro reclamation and other measures in order to adjust the water, heat, and the air regime of the soil. Well you know that the vegetation which is there or the area which has not been used for a long time. We will have several things which are essential to be essential to be removed for our requirement as may be farming, or for a building a structure. or for any other thing.

So that means you would like to channelize certain things, you would like channelize the water reserve which is there, or the heat, and air regime of the soil. How is the condition of the soil? How what sort of manipulation this soil needs to be brought to a particular level from the condition in which it is at present.

Create more helpful condition for agricultural practices well. If you are thinking that it is for farm operations are for growing an orchard, or to growing a crop, cereal crops or whatever. Then you would drag that you have to create situation for that a favorable condition you have to situate.

And then when you are talking of this we increase the fertility of the soil, by doing that you might like to increase the supposing we are thinking that we would like to have more of a farm land which has to be either a orchard has to be grown, or a cereal crop has to grown, or a root crop has to be grown. Whatever may be the situation when you are thinking of this you are thinking of increasing the fertility of the particular land? Well.

So, land development for reclamation and leveling is the costliest operation in the farm yes it is so. Because then one things something which has been totally in the in the (Refer Time: 05:17) situation all the stones, bushes these that so many things are there. You now need to clear all those things.

So, it is a hell of a job and definitely everything requires some energy and that energy in terms of the equipment energy, in terms of the cost involved in that, in terms of proper implementation for depending upon what we want to do. So, this is definitely a costly affair, but then if you have the objective, if you have the purpose for which it has to be done. We have no other alternative, but then to go for such act.

So, if what are the things that it will definitely it will like to clear the jungle which is there if jungles of see the bushes etcetera. There would like to clean that clear there.

Then soil opening of the deep tillage equipment if you have the soil to be opened, or maybe you would like that there should be proper drainage or you would like that the soil should be open at a certain depth so, that the whole layer of the soil is opened and then we can know what is the fertility of that or what will be the nutrient content of that.

So, we would like to move that. Moving soil from high to high to low spots yeah sometimes we would like to do this as well that we will like to move the soil from high to low spot, making farm roads, yes this will be required field bunding and leveling etcetera. So, these are the various operations depending upon whether it is meant for a building or for this. So, as such land reclamation in nutshell will mean that you would like to change the existing condition of an area irrespective of whatever is meant for.

In order to get a you can say that congenial atmosphere of the soil, of the air, of the whole environment for creating a particular suitable facility which will help you either if it is a farm land fine. It may be for growing orchards, if it is for cereals fine, or if it is for creative building, maybe for school or for any other recreation building, or park whatever.

So, you need to you have an objective and accordingly you need to do all these objectives. So, this is what land reclamation means. Now, once this is meaning which is understood to us. Let us see what are the way by which we can do these operations which are essential for doing this.

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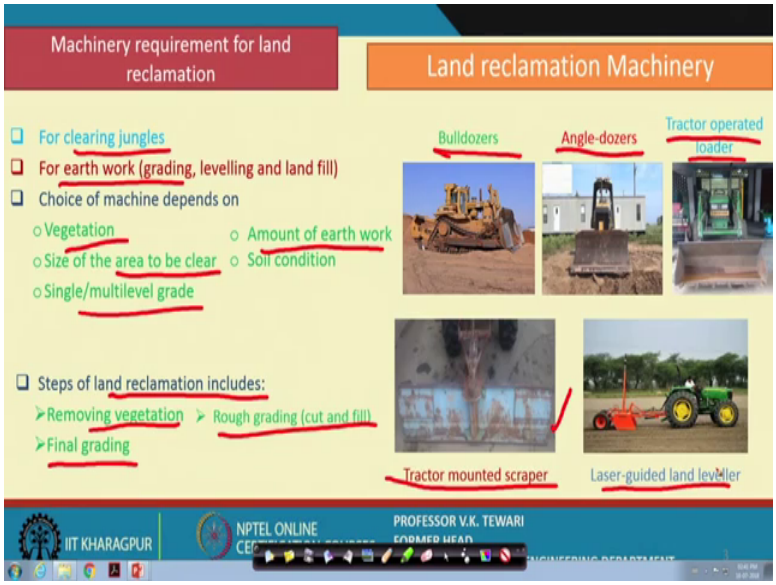

See the various essential things which are required for this land reclamation is the machine which is required. What are the requirement of the machines? What do you do as I said earlier that you will need to clear the jungles, you need to do some earth work maybe moving soil because some you will find that things are not leveled.

So, you would like to level that field because anything that you want to do has to be in a proper way. Otherwise the may be that at one location if you are talking of even irrigation you will find that at one location the depression is more, and the other location depression is less. So, the amount of water required will be varying.

So, in all these we need to do the some earth work. You need to do while clearing the jungles earth work by grading, leveling, and filling the land as it will be required, then choice of machine. Now what are the if these are the tasks to be done.

What is the requirement for a machine to be chosen for the particular task? Well it will depend on, what is the level of vegetation which is there. What is the area to be cleared? Then everything in multiple grades, what are the grade maybe it is depending upon what is the condition we have to think.

Then the amount of earth work has to be needed because you will definitely while you are thinking of all these things you will have to have an estimation of what is the volume of soil which has to be moved. What is the vegetation which has to be cut very it has to be disposed of, many things you have to think in this line.

Then the steps for land reclamation includes then if you think this then what are the steps for yes removing the vegetation the first thing which is there. Whatever may be the equipment you use you have to remove that first. So, that you the land is open to you at least you will have a look at those the whole land and then you will see, what is the grade of that? What are the type of soil it is and several things.

So, rough grading of this; that means maybe cut and fill sort of a situation. So, that you get a level land whatever you are thinking of and then final grading of this. So, as such in land reclamation will mean that a condition has to be improved to another condition. And then it will depend on what is the level of vegetation required? What sort of condition we are looking for or how much of work has to be done in with respect to the earth movement and things like that.

And now here we have listed some of the equipment as you can see that there are various types of equipment and machines which are available for this land reclamation. Well as an agricultural engineer I think it is important for you to have an idea about this not necessary that you go because these machines have been developed long back and they are very much in use for all these operations.

So, what is important for you is to have an idea what are their capacity? What are their sizes? And under what conditions they are used? So, this is important for you even to have this information it is not that you will design particular equipment and then only you can use it. So, it is worth having the information about this, certain details of this and you can always look into the literature get the machines from the manufacturers you require depending upon what you want to do the operation.

So, just have a look at these machines for example, we have the bulldozers well, you can see that in how they are then angle dozers, depending upon what exactly you want. Because sometimes you will like to move the earth from one location to another location, tractor operated loaders in the area these loaders are also required.

Sometimes you require the field to be leveled. So, maybe earth has to be cut from one location and pushed to the other location. So, the front head loaders are there the tractor mounted is scraper. You would like to scrap the material maybe from one location depending on how much scrapping you want maybe certain depth, and then you want to scrap the material to another side or to bring to one location.

Then laser guided land level. Now this is one equipment which I had already discussed in my lecture if you have gone through that and I have discussed this in detail quite detail about what are these operations, what are the mechanics behind it and how it works?

Here I would just like to say that this also gets added up in the land reclamation machinery. Because once supposing you are talking of even a building construction and you want that the level land should be level. So, you will need this machine this has become very essential machine for umm actually for irrigation.

Because in the irrigation you would like that the same amount of same height of water is there in the whole field. And in order to maintain that you have to have the whole field

properly leveled and this is the equipment which has been extensively used in all over the world.

And more so in Asian countries like ours and other countries in Asia, so these are the land reclamation machinery very often (Refer Time: 13:09). There could be small ones which we are not talking, but there these are more important ones which are used for various operations.

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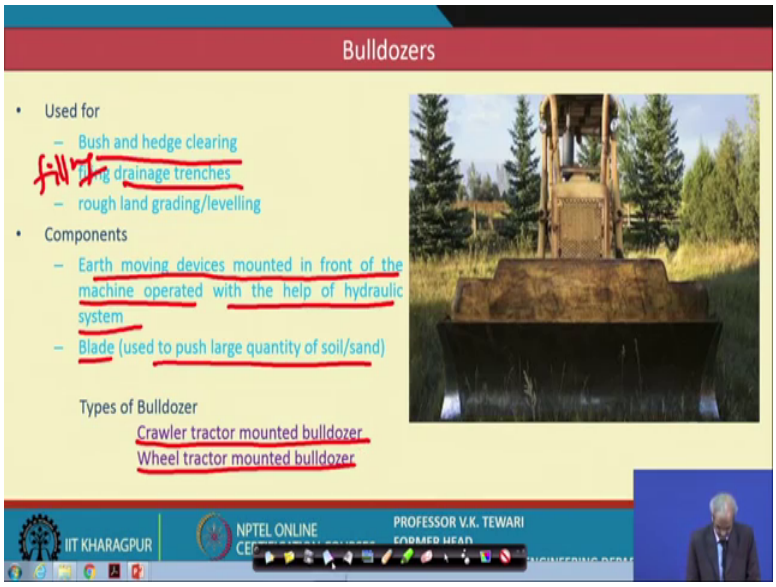

Then what are the bulldozers? And what exactly is the job that they do? You say they use for bush and hedge clearing yes you can clear depending upon the condition yes while we have written here that clearing.

But depending upon the condition if it is very stony then you have to have something else before actually bulldozing the whole thing. Then the drainage trenches, the filling of the drainage trenches I think this should be filling, rough land grading, and leveling. So, you would like this should be there.

Then the components what are it is components? Well, we have just noted on here their components to have an idea for. Now you see these the components main component is the one which is the base bucket itself which we call if you call the scrapper blade which is there this is there. So, the earth moving devices mounted in front of the machine operated with the help of hydraulic system.

This is component one number one then you have the blade used to push large layer. So, these the blade that is there and mostly if you consider this then the blade is the one which is very important component you have the other machinery. For example, the power source as such the power source is connected and since this is a large work and it requires. So, much of power we have to have a hydraulic system employed into this otherwise it is not possible, mechanically it is it will take lot of load and the total work output also will be less.

Types of bulldozers well there are various types which are available to just name through crawler tractor mounted bulldozers, wheel tractor, mounted bulldozers. So, these are the two types which are mostly used in the for this operation.

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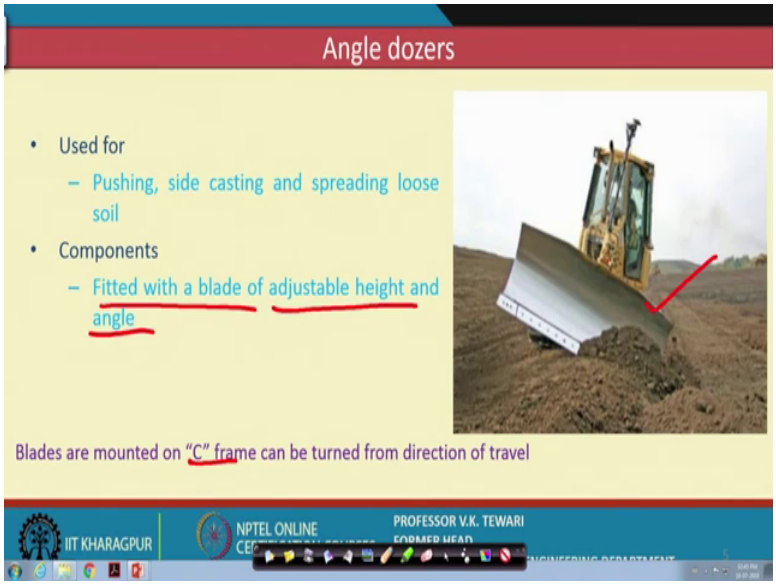

Angle dozer well angle dozer, what is the job of this, how at what angle? See used for pushing, side casting and spreading loose soils. Sometimes we would like that the from a corner or from a location the at angle you would like to keep the material. So, this is used for that and it is components well the components are like similar ones fitted with blade for adjusting the height and angle.

So, since it is called the angle dozer at certain angle needs to be to be maintained and hence the blade which is there put at certain angle. You can see this in the photograph which is seen shown here. Blades are mounted on C frame and can be turned from

direction of travel (Refer Time: 16:24) well. There is a C frame behind here and these are blades are mounted on that.

Well this we are not telling about every details of that, but what is important is the power. And power which we are using from the hydraulic system of the power source which is there. So, we have to have a hydraulic system which will which is being used.

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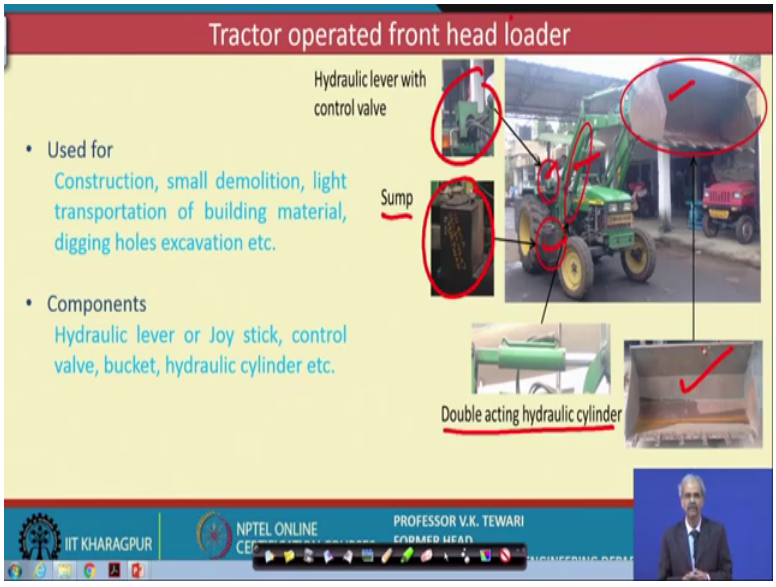

Tractor operated front head loader. Well this is another one which is important and which is very much used with the tractor and then you would say that yea this is the one which is. In fact, eleven to an agricultural engineering not necessarily as such, but just because tractor in there you would like to say that yeah this is one which is in relation to that. But I would say that this is also an important one, we call head loader.

See this is used for the construction of a small demolition, light transportation of building materials, digging holes and excavation etcetera. There are various components hydraulic lever, or joy stick, the control valve, bucket hydraulic cylinder etcetera is a some of the details of that I think we may show you the video of this.

So, let us have a look at the video of this particular equipment yeah in this have a look at how the whole thing is in operation here. But the various other aspects of the system are you can see here that the double acting hydraulic cylinder. We will talk of this then there is a sump here this is where it is and the lever with controls these are the lever with

controls which are which are shown at the various locations. These are the cylinders which are there and then the bucket this is the bucket which is there which you have seen over here. So, this is the bucket.

So, as such this is one tractor operated front head loader which is used for lifting the material, carrying the material, and then load loading on trucks or wherever you want this can be done.

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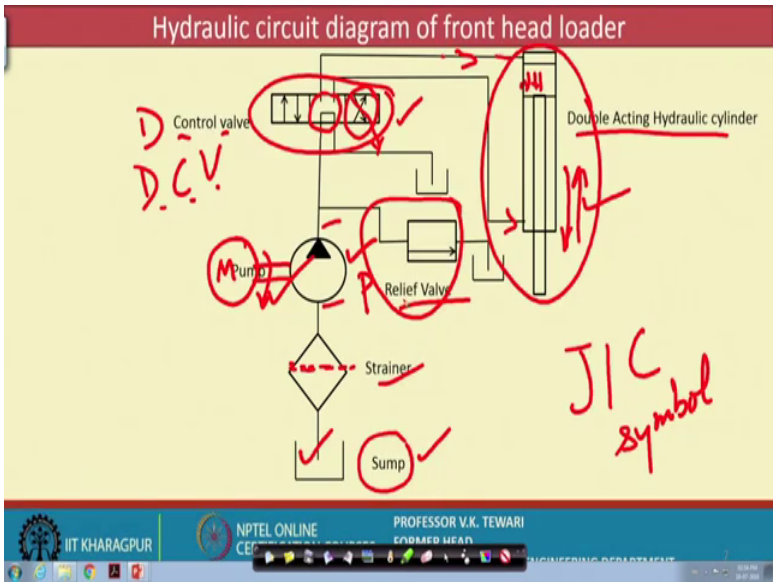

Well it is essential we thought that I am not aware how much of the hydraulic knowledge you have. But I wish you would have learned something about the hydraulic system in the previous courses, or maybe your teacher might have taught you while he was he might have thought of about the hydraulic system of tractors.

But then we thought that even if you have been told we would like to add up something to this knowledge of yours for so, far as the hydraulic machinery is concerned and the machines which are used for the land reclamation.

Now, you see that for a hydraulic system what you need if we are pressurizing the oil and we are using this power of this oil. So, we need to have certain location where this oil will be there you can take the power from the actual in actual power of the tractor, but then in that case you will not be able to use that much.

So, that is why a separate arrangement is made which I had shown you in the earlier slide the various components. So, we have here the various components like this is the sump here; that means, in this location we put the oil. This oil has to be at one location which is open to atmosphere then after this has to be actually a strainer, the oil which is there it must be a clean oil which should be taken up from the sump.

Once this is oil is available to us we would like to take this and use through this particular pump. A pump is there which will pump this oil from here and then it will pressurize. So, a pressure here will be atmospheric pressure and then here it will be pressurized oil. Now, this pressurized oil then can be channelized for doing the job.

Now channelized for through this control valve this is called a directional control valve. And what you do in this in fact, this is way you channelize the job that you want to do. For example if you consider the job the condition here for double acting cylinder which is here.

Now here the job is it is called double acting I must tell you where. Why? Because for extend if you say this is extend portion and then this is retract. So, extend and retract both are taking place under pressure. So, this is why it is known as double acting hydraulic cylinder.

And it is essential because many a times you would not like that the extend is fine, but the retract is suddenly done. Then we would not like this and that is why for heavy load and for controlled load handling it is very essential the double acting hydraulic cylinders are used.

So, what will happen is the oil if you can see this is the center position of the directional control valve. This is in factory symbol for a directional control valve we call DCV. So, this D C V directional control valve. So, as this directional control valve center position shows here that the oil pressurized oil will come here.

If you are talking through this then come here and then pressurized this, so that the extent will take place. Now when we are talking of the retrieve that we are taking this portion retracting in that situation what will have? Then the oil has to move it has to take this course; that means, oil has to move from here and then it should move like this. And then the oil will pass through this go like this and will come back.

So, this is the situation in which the system works; now a simple double acting cylinder hydraulic circuit has been shown to you. If you have learnt at some location it will be easier to understand, if you have not learned then I think you need to look for some other details of that.

But as such the components I will tell you as I said that the sump is essential for having a material, then cleaning of the oil must be there before it is taken. Then there is a pump here and in fact, this pump is in fact, by operated by another unit which is either an engine, or a an electric motor, so this is powered by this. So, that there is then this pump works.

So, then this pump will pressurize the oil and this pressurized oil is then either pushed through this for extend and or pushed to this for extend. These are the different 3 positions of the directional control valve. Since this is the JIC symbol, in fact JIC symbol. These are the JIC symbol this circuit is made with the JIC symbol for the various components of the hydraulic system.

So, many a times what happens when the pressure is very high then at that time in order that we would like to save the system. There is a relief valve pressure relief valve this is called pressure relief valve here PRV, which is a Pressure Relief Valve which is set at about 20 to 25 percent more than the system pressure.

So, this particular relief valve is set at this pressure higher pressure than that. And there is no problem in the system as such it will take care of the exigencies in their load which is which increases.

So, accordingly then this circuit is one which is working in the load of that I have shown you earlier. And we thought worth to tell you about these to introduce you to this particular thing, but this particular system or the circuit. If you have more information you can always ask and we will be happy to answer this in due course of time when you require that.

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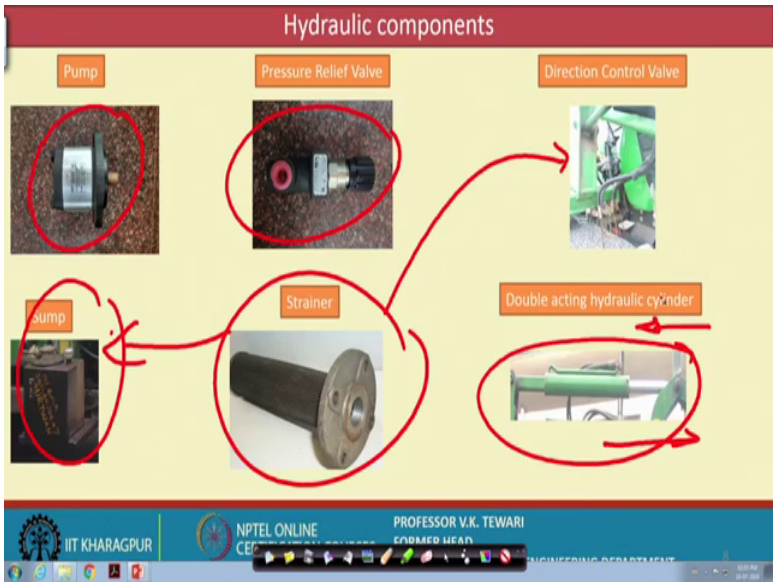

Some of the components of the hydraulic system it is worth going some more details into that although we have shown you that, but I think it is worth showing you see as the sump. Now this is what? It is container it is a properly sealed here and then you can keep the oil depending upon how much oil you need to handle at what pressure.

So, these things are very important and the quality of oil which has to be there the quality of oil which has to be drained out of this. Then the pump this is the pump. In fact, this is all these are positive displacement pumps and they work at very high pressures. So, these pump been has to be used then pressure relief valve yes there is a pressure relief valve which will take care of the safety of the system as I indicated earlier. Then the strainer here this is strainer is in connection with the sump here.

Because then it will clean the oil which is going and then go to the directional control valve; that means, it will go to this directional control valve here. And the directional control valve will permit the operation of this particular hydraulic cylinder either in this direction, or in this direction depending upon what is your requirement.

So, as such a brief introduction of both the operations are given to you here. And you can understand about the system more details can be had at any book on hydraulics you can learn more.

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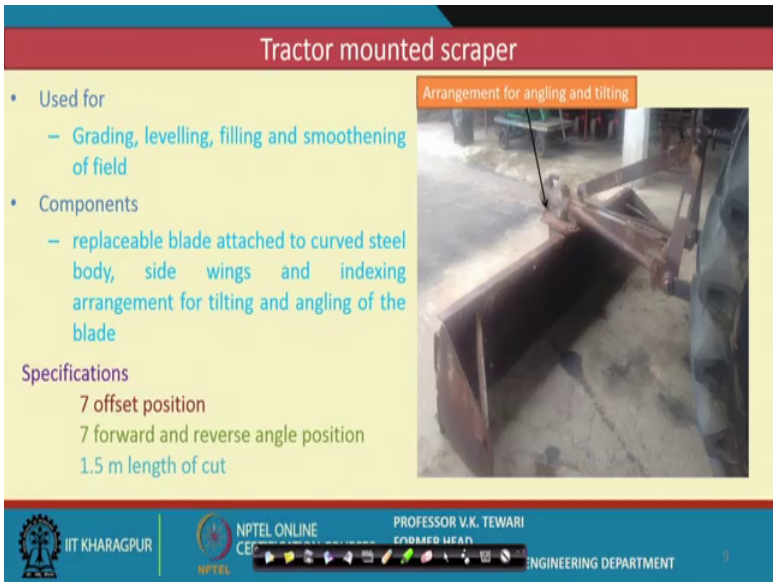

Well tractor mounted scrapper; well we had already shown you the similar thing here. And so may be that we will show you the operation of this particular equipment you can have a look at this it is being used somewhere.

So, you can say this is a there earlier one was in front mounted and this is a rear mounted. And you can see that how the operation is done just and you can say that a demonstration of how it works nothing else depends on you where you would require this and all that, but a demonstration of the thing which is used in the system.

You can see that anywhere you can you can lift because it is connected to a 3 point linkage. So, you can lift it and then do the job and put the materials on one side as it is being done in this particular situation here. You can have a look and see this is connected to the 3 point linkage of the tractor at the back.

One thing one must be very clear about the capacity of the tractor, or the size of the tractor when you take this. Because these are heavy earth moving machinery, all reclamation machinery heavy earth moving machinery you have to be very careful. In fact, you have to take a very high factor of safety when you are working with these machines particularly this the land reclamation machinery.

Whether because you do not know when what may happen? What sort of loading will be suddenly coming onto the system? So, this is what it is Well the various now you can say

that the length etcetera size of this have be given about 1.5 meter is the length of curtains. And the 7 forward and reverse angle positions which you can have through the system which is attached to this particular equipment.

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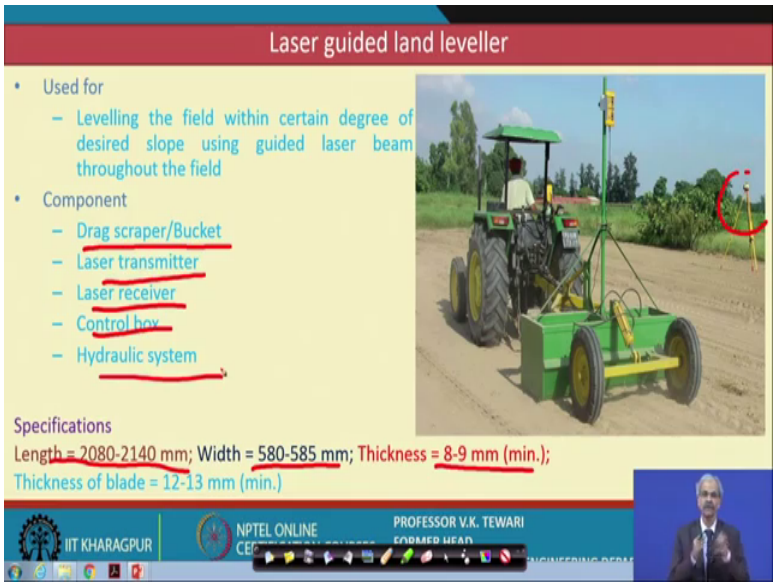

Well laser guided land leveler I said earlier as well that we have did not discussed to deal of this particular equipment earlier and the concept on which it works. So, it is very essential that you use this equipment whenever it is required.

And there are some details are given as specification. I do not know whether you recall that or not if you have not then you must to know that there is a here. When we are talking of the system there is another aspect which is at one location here. And then we see how the laser is reflected and is received. So, depending upon where it is and how you have located these you will be able to do the job, but it is just a very good job. Some details are given about the length generally it varies from 2080 to 2140 millimeters, the width is about 580 to 585 millimeter, thickness about 8 to 9 millimeter.

A minimum of this and the various components you can see the drag the scrapper or the bucket which is there. Laser transmitter, laser receiver you need to know about this. Then the control box which will control the system and the hydraulic system anyway which is which has been told in detail.

So, as such in these couple of equipment, which I told you about land reclamation machinery. I think as an agricultural engineer it is it is a very important for you to have some idea about this their specifications, their working, their availability and their general use where they are supposed to be. Not necessarily that you will know every detail of the mechanics of that design, because that is not required as I said earlier.

What is important is the information which you should be able to gather and which you should be able to use whenever such a situation arises for you in the requirement as the case may be. So, I think in detail we have discussed these we would we would definitely expect questions depending on what you find in this lecture. And then we will be happy to answer these questions.

Thank you.