Evaluation of Textile Materials
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Lecture-29
Evaluation of Moisture in Textiles

Hello everyone today's topic of discussion is moisture in textiles.

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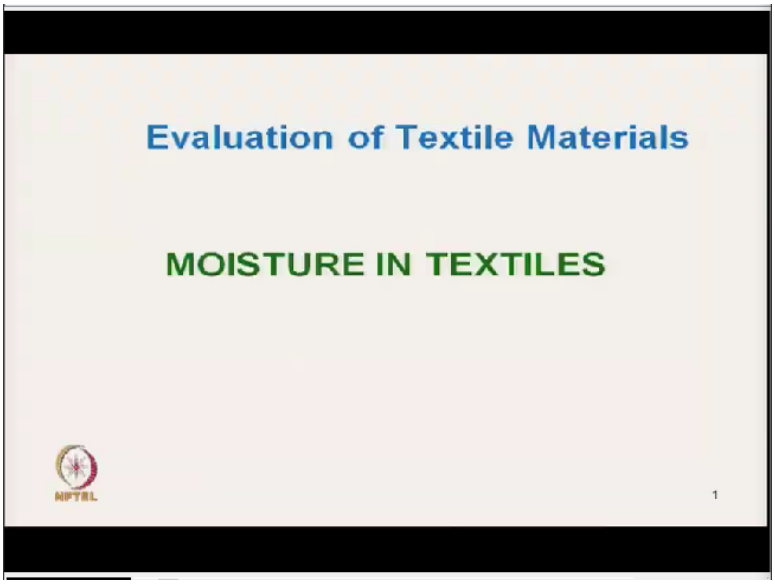

Today we will discuss various factors which affect the moisture content or regain in textile materials and how presence of moisture in textile materials affect the characteristics of the materials and also we will discuss how to measure the moisture in textile material. And another most important part related to moisture content is that when we sell textile material and we sell the material as the textile part not the moisture ok.

So the water content in textile material sometime it gives some wrong wet that is why we have to correct the total wet of consignment, that is called correct invoice wet. So, that will discuss here how to correct this, so before that we will discuss that the moisture how the textile material receives a moisture basically it receives moisture from the atmosphere. So before we discuss the textile material first we should understand the atmosphere.

And also it is not possible for any textile material without having any moisture. So that is how there are actually the acceptable moisture which is internationally acceptable and that is for different type of fibre different fibre. They regain different types levels of moisture, so all these aspects we will discussed today.

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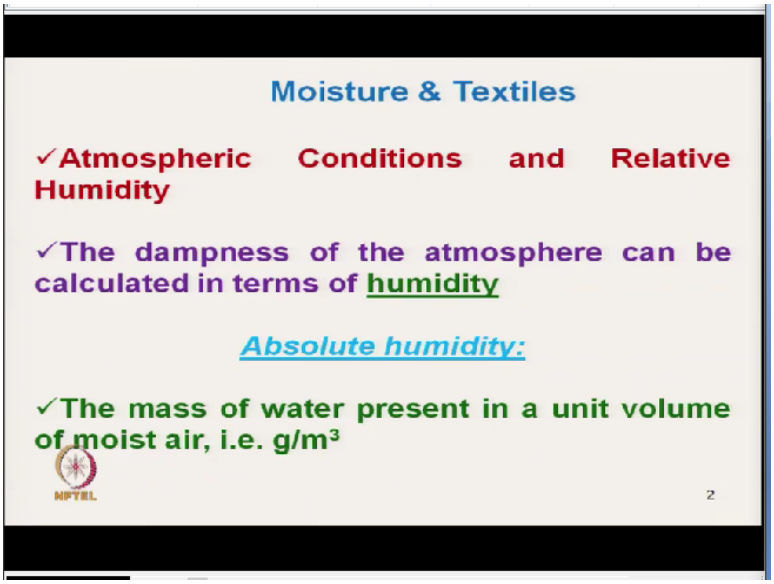

First we must understand the atmospheric condition, different atmospheric condition different relative humidity of atmosphere or temperature affect the moisture regain characteristics, typically the moisture regain of textile material, the moisture present presence of moisture in any textile material depends directly on relative humidity of the atmosphere. So first before understanding the moisture presence in textile material we must understand the atmosphere.

So it is expressed in terms of relative humidity ok. So what is humidity ok. So, what is humidity?. The humidity is the dampness of atmosphere and that can be express in terms of humidity. And there are 2 types of expression one is called the absolute humidity that means suppose this is chamber room.

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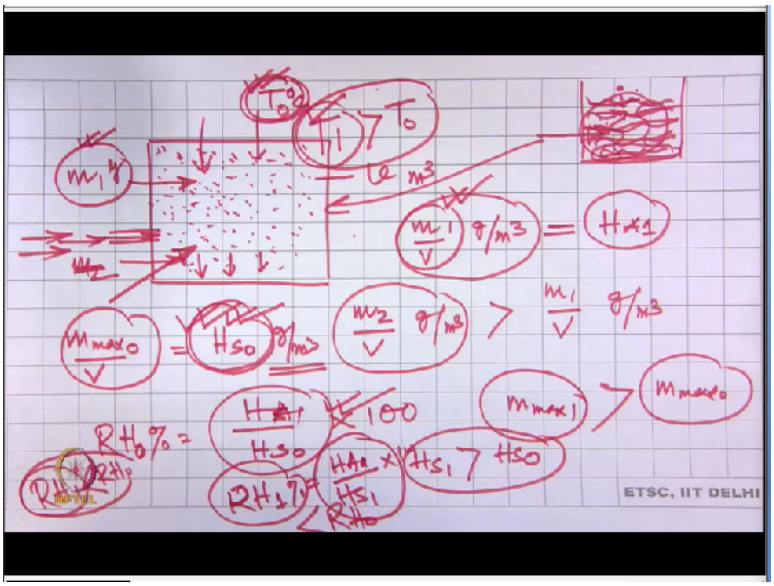

So, there are water lever moisture present in the room throughout ok. Now if we take the total mass of the water present it is not in the liquid form it is in the vapor form. So mass of the water present in the atmosphere it is called, so the it is called the absolute humidity, that means mass of water present in unit volume of air. So, suppose the volume of this room is say v and v in meter cube and if the what total water content in the room is m gram.

So the absolute humidity can be expressed in terms of m/v gram/meter cube. So, this is the absolute humidity, now keeping the so, for same temperature say constant temperature say T, for constant temperature T if we in Z some more moisture vapor here in the room that means the suppose it was initially it is m1. But the same room if we inject the moisture vapor some more moisture vapor and after certain time the total mass become say m2.

So the absolute humidity of this room will be m2/v gram/meter cube which is more than m1/v gram/meter. So this absolute humidity directly shows the amount of the mass of water present per unit volume of air ok. But so this is very nice figure absolute humidity, but it is very difficult actually that it is a in practical sense the owing the taking mass of the of this of the water in this room in a particular area volume it is very difficult.

So, we have to use some alternate easy way we express the humidity and that is the that is called the relative humidity, now what is relative humidity.

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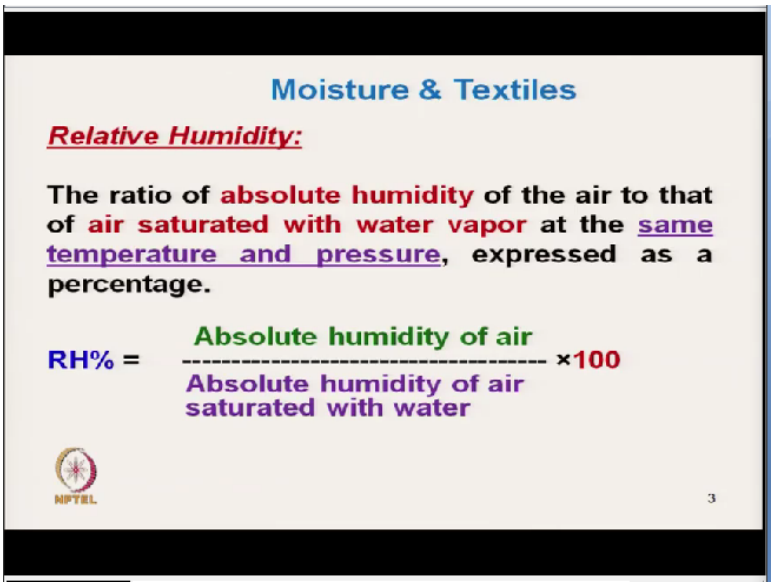

Relative humidity is the it is a ratio of absolute humidity of the air to the air to that of air saturated with water vapor. So at the same temperature and pressure. Now suppose in this room we are coming back to the earlier situation, in this room at T a temperature T degree Celsius temperature. Suppose the mass of water vapor present is m1, now gradually we are trying to increase the moisture content in this way ok.

And the moisture content gradually it is increases, so initial the moisture absolute humidity is that HA, HA1 is the absolute humidity, absolute humidity at temperature T. So, keeping the temperature constant but we are now doing we are trying to inject moisture here. So, if we try to inject moisture here, so after certain time the room will be fully saturated and it will not be able to hold any moisture vapor.

Then moisture will start dripping like water droplet, that means at that temperature the air will not be able to hold excess moisture vapor. At that condition is known as the saturated humidity saturated condition, at that condition the maximum water content mmax/v. This humidity is known as the H saturated humidity this is the A saturated humidity of this room in gram/meter cube. This situation we can actually similar it is similar to that of the solute and solvent ok.

So, if we gradually mixed some say sugar solution sugar in the water. So gradually it will get initial soluble, so after certain time that sugar will not be the water will not take extra sugar. So, the sugar will be actually it will be precipitated at the bottom that means at that condition this water it is called the solution is called saturated solution. Similarly at this condition mmax maximum quantity of water particle present in air divided by the volume.

And that is called the Hs saturated absolute humidity ok. Now if we take the ratio of this 2 Hs/H this ration then it will be called the relative humidity of the air ok. The absolute humidity to the air that is the absolute humidity this is the HA1/H Hs saturated. So this ratio if we multiply express in terms of 100 that interrupts of percentage, this will be called relative humidity percentage. That means the actual humidity at that room divided by the saturated humidity at that room in same temperature and pressure condition.

So, at the same temperature and pressure condition, so this will be the ratio. Now here the temperature place an important role because if we increase the temperature of the room. Now it is say T1 which is more than T say initially it is 0 T0 at T1 higher temperature. The air in the room will be able to received some more and more higher quantity of humidity, that means the saturation humidity saturated absolute humidity will be higher.

So, that means the arrange percentage will get changed, so that so if we in that case suppose Hs H0 was there. In that case, so the room this m1 quantity is there but if at higher temperature say T1, T1 temperature the saturation humidity will be mmax1, mmax1 which is more than or place suppose it was 0 mmax0. So the saturation humidity will be more than the more in the higher at higher temperature.

So Hs1 is more than Hs0, so keeping the absolute humidity of the room as m1. So, in that case at higher temperature relative humidity will be earlier it was RH0. Now RH1% will be HA1 suppose absolute humidity/satuartion1 ok multiplied by 100. Now this value will be less than RH0, so RH1 is less than RH0 because the denominator here it is higher ok. Denominator for RH1 is higher, so that is why at for same condition**.**

If the temperature increases the if the quantity of moisture present is same it is relative humidity will be less. So, that is why the relative humidity is directly related with the temperature and also the pressure with the increase in pressure vapor pressure or atmospheric pressure. The capacity of holding the moisture changes ok, so the relative humidity is expressed in terms of absolute humidity of air at particular temperature ok, that is the actual quantity of moisture present in the air/absolute humidity of saturated air ok.

But the temperature must be same and if it is expressed in terms of percentage, so that means relative humidity 65%, so what does it mean we cannot simply say relative humidity 65%, 65% relative humidity.

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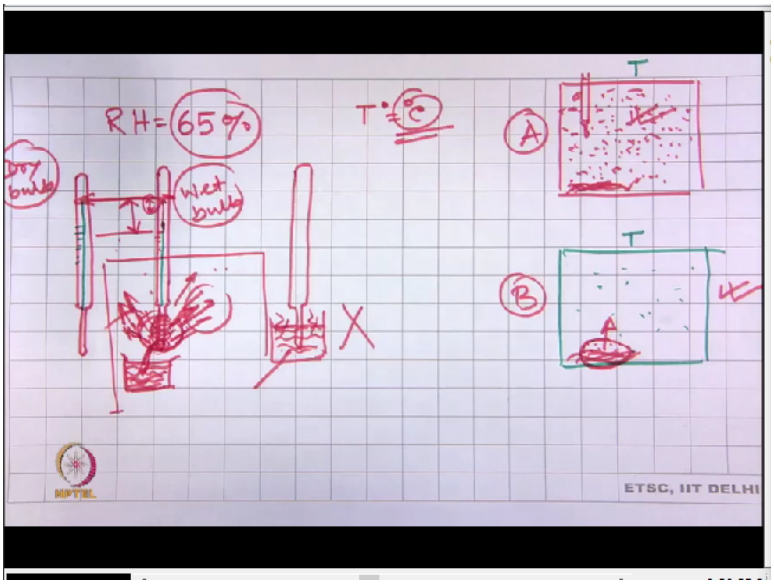

We cannot say simply we have to specify the temperature, temperature we have to specify, so in degree Celsius or degree Fahrenheit. We have to specify the temperature then only we can tell, so RH 65% means the absolute the ratio of the absolute humidity is 65% to that at the saturated humidity.

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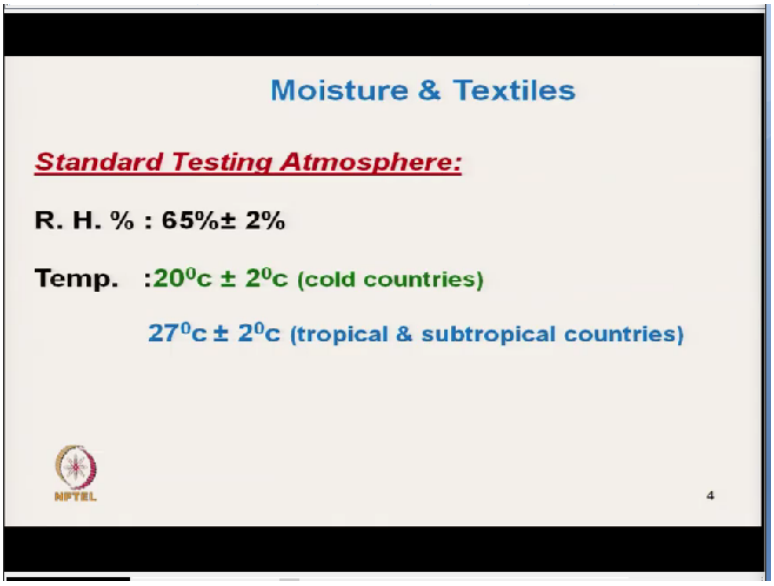

Now standard testing conditions are specified because otherwise if we change the standard change the humidity or temperature that the total result total test result will get affected ok. So, relative humidity is specified as 65% +- 2% that is the internationally accepted relative humidity for testing textile material. If the testing if we test the textile material at higher relative humidity the total all the characteristics will get affected that we will discuss today.

And the temperature in throughout the world actual it is 2 standards are normally followed. In cold countries 20 degree Celsius +-2degree Celsius is the temperature is followed. And tropical and sub-tropical country we follow 27degree Celsius +- 2degree Celsius.

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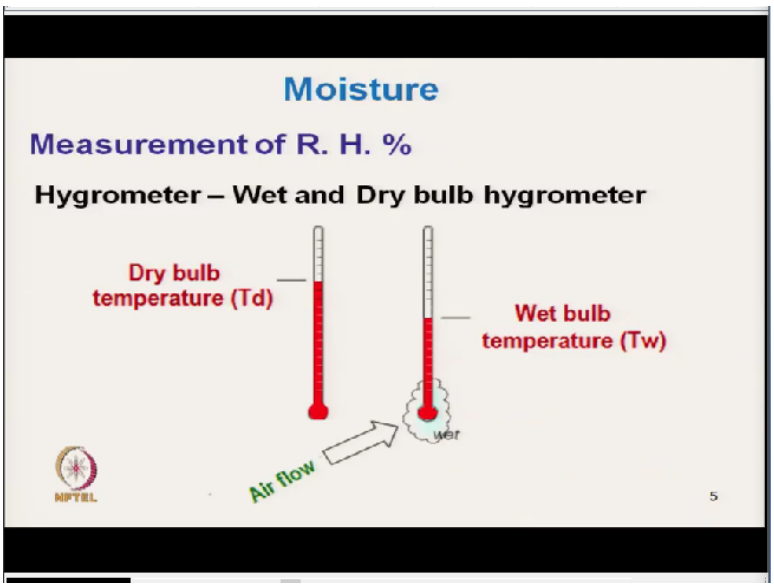

Now how to measure the relative humidity, as we have just discussed that the relative humidity is the measure of content of air ok, content of how much moisture present in the air that is are relative humidity. Now the basic way of measurement it is called dry bulb, wet bulb principle this is once simple thermometer, it is called dry bulb ok. This dry bulb thermometer it is placed in this room suppose it is a dry bulb, in that atmosphere it is kept.

Now this requires the temperature of the room, so at normal temperature it is my record. It records the temperature, so that we can record this is called dry bulb another thermometer. Here in this thermometer here it is rapped with some wet cloth or something ok. And this wet cloth should always it should be wet it should wet and there will be some water source. So, now if it was why is it ok why what is the principle? Why should we do this?. Because suppose it is kept dry it is this system is not there.

This is not done, so what will happen the in that case both the thermometers, this thermometer they will show same reading in this case if it is dry now in that after that we do we are keeping we are dipping this bulb under water simple. We are dipping it this is water, this bulb is dipped now will it work it will not work because it will simply measure the temperature of water. what will want?, we want to measure the humidity present in air.

Now humidity present in air we can measure by evaporation method suppose we are keeping something dry wet material here. Now if the humidity is less suppose this is one air condition another room is having very less humidity present in the air, temperature is constant exactly same temperature. Now in both the rooms we are keeping some wet cloth same wet cloth, now in which case which room say this is room A this is room B.

In this room we will find that the cloth is getting dried up quickly and in room A this is not at that fast rate. Because the moisture content moisture present in room B is very less. So that is why it will try to take moisture at faster rate. So, as it is taking moisture at faster rate, so due to then that means it is getting moisture is getting evaporated. So, it will during evaporation it will the water particle will take the moisture particle will take latent it from surrounding area.

Now here instead of dipping this under the water, here what will happen?. The water particle will not get evaporated at that fast rate only it will get evaporated from the surface at slower rate. But if we rap this bulb of this thermometer with wet cloth and then let the water get evaporated from the wet cloth. So depending on the moisture content moisture present in the atmosphere the rate will change that means as the moisture present in the atmosphere is less.

If it is less then rate will be at higher, so that means it will take receive it will actually take latent it at very higher high rate. So, then what will happen as it is taking latent heat from this around this area. So, it will take latent it from the bulb of the thermometer and, so the temperature will drop gradually temperature of this wet bulb thermometer will drop immediately ok. So, that and then this difference in temperature is the indication of presence of humidity, on the other hand if the room is fully saturated like this.

The rate of evaporation of moisture vapor will be very slow, so it will take latent it at very slow rate. So the difference it will the temperature drop will not be that much, so the difference will be less that means the difference in wet bulb and dry bulb temperature indicates the presence of humidity at that atmosphere ok. So this dry bulb, wet bulb, so here now we have to supply another thing we should not forget to connect the other end of this weak, this is this must be one weak material.

We should not forget attach this with the water source if we do not do if we only rap with the some wet cloth what will happen?. After certain time this will be dried up and in after if it is get if it is dry then again this temperature will go up. And this will be stay equal, so other end of this weak wet cloth should be actually connected with the water source. So, we must keep the wet bulb always in wet condition another thing sufficient care must be taken. So, that proper cleaning and the proper evaporation takes place here ok.

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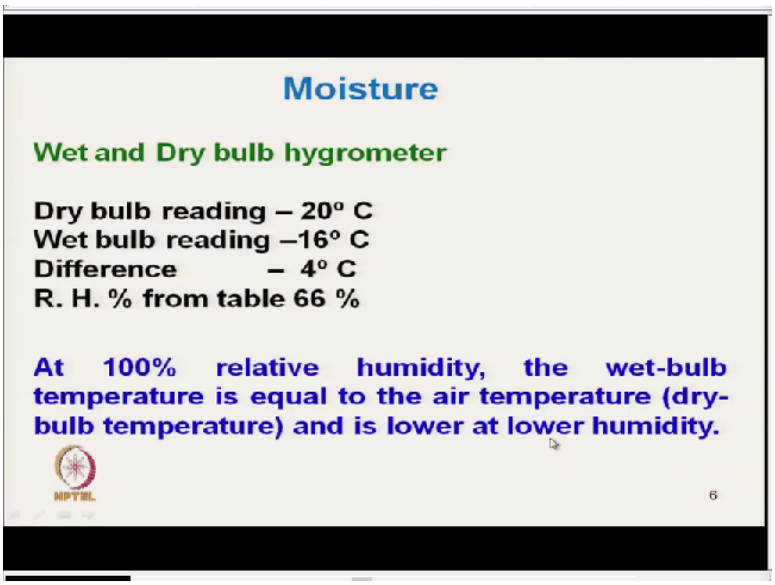

Now dry bulb reading suppose it is 20 degree Celsius, for example in certain condition and wet reading is 16 degree Celsius. So, we must take the difference the difference is 4 degree Celsius and from table there is a standard tables are level and from the table we can read that the relative humidity is 66%. So at 100% relative humidity as we have discussed the wet bulb temperature is equal to the air temperature.

Because if the humidity is high, in that case at 100% relative humidity suppose in this room it is 100% relative humidity. So, that means this water particle the vapor will not come out from the from this wet bulb that is the wet cloth and so as it is not coming out, so temperature will not verse it is not taking latent it. So temperature will remain same as the dry bulb temperature and now, so this data if we have say dry bulb reading and we have say wet bulb reading. And difference we know and if refer table we can get the data now let us see.

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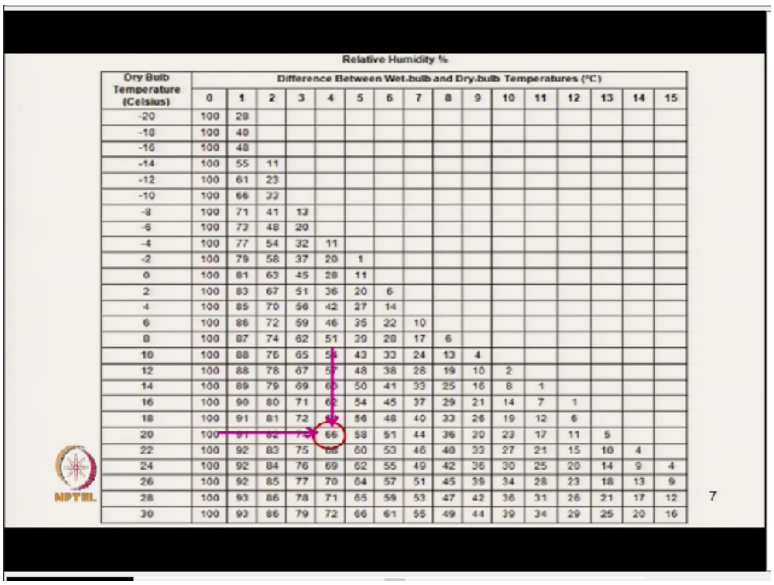

Relative Humidity %

Dry Bulb Temperature (Celsius)	Difference Between Wet-bulb and Dry-bulb Temperatures (°C)															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
-20	100	28														
-18	100	49														
-16	100	48														
-14	100	55	11													
-12	100	61	23													
-10	100	66	32													
-8	100	71	41	13												
-6	100	73	48	20												
-4	100	77	54	32	11											
-2	100	79	58	37	20	1										
0	100	81	63	45	28	11										
2	100	83	67	51	36	20	6									
4	100	85	70	56	42	27	14									
6	100	86	72	59	46	35	22	10								
8	100	87	74	62	51	39	28	17	6							
10	100	88	76	65	54	43	33	24	13	4						
12	100	88	78	67	57	48	38	28	19	10	2					
14	100	89	79	69	60	50	41	33	25	16	8	1				
16	100	90	80	71	62	54	45	37	29	21	14	7	1			
18	100	91	81	72	64	56	48	40	33	26	19	12	6			
20	100	91	82	74	66	58	51	44	36	30	23	17	11	5		
22	100	92	83	75	68	60	53	46	40	33	27	21	15	10	4	
24	100	92	84	76	69	62	55	49	42	36	30	25	20	14	9	4
26	100	92	85	77	70	64	57	51	45	39	34	28	23	18	13	9
28	100	93	86	78	71	65	59	53	47	42	36	31	26	21	17	12
30	100	93	86	79	72	66	61	55	49	44	39	34	29	25	20	16

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This is standard table here in x-axis this x-axis direction it shows the difference in dry bulb and wet bulb reading, that is the difference and the vertical column. This columns row shows this is the dry bulb temperature. So, rows are showing the difference at certain difference in dry bulb wet bulb temperature and these are the relative humidity data say at 0 degree Celsius ok. At 0 degree at any temperature if the dry bulb and wet bulb readings are same.

Then the humidity will be relating humidity will be 100%, that means there is no evaporation as we have explained. Now looking back to the last data, so what we have seen the dry bulb reading was 20 degree Celsius, this is 20 degree Celsius and difference in dry bulb and wet bulb was 4 degree Celsius. We can read in this fashion and that gives the reading of relative humidity of 66%. Now here it is interesting to see say at any temperature suppose at 30 degree temperature of room.

If the difference is 0 it is 100% and as the air becomes dry and dry that means the air becomes dry means relative humidity is reducing. And air our difference in temperature is becoming higher and higher. So on the other hand way we can see if the difference between relative that dry bulb and wet bulb temperature is high. In that case that shows the air contents the lesser amount of humidity that means relative humidity is low.

So, that suppose you just see for that 20 degree Celsius if the dry wet bulb is temperature is same 12 8 degree Celsius in for 20 degree Celsius room. If the wet bulb temperature is say 8 degree Celsius. That means the there will be 12 degree difference in dry bulb and wet bulb. In that that source the air relative humidity is very it is a air is very dry a 11% relative humidity. So, this table gives clear a very quickly we can get value of relative humidity.

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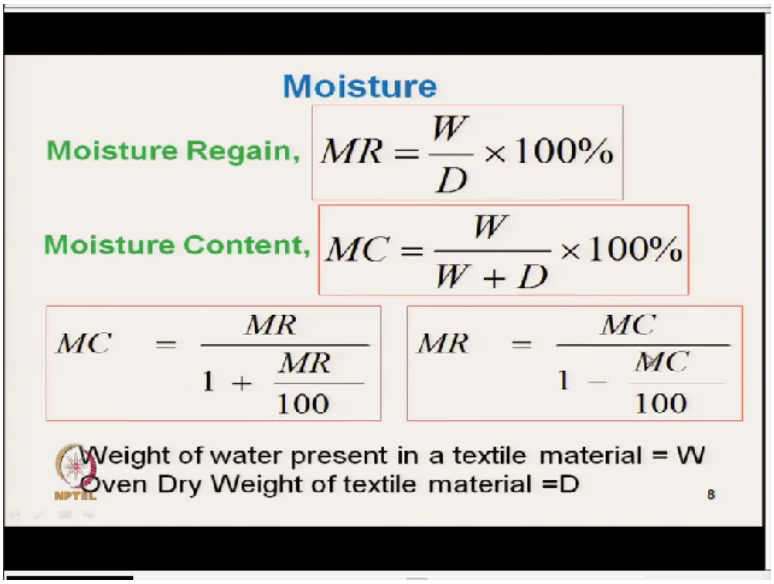

Now how to measure the moisture present in the textile material, so it is expressed in 2 ways, 1 is the moisture regain and second is the moisture content. So, moisture regain it is nothing but the ratio between water present in textile material W/dry wet if we remove all the water content in the water present in the material it is a dry wet. So, that will show it is the moisture regain of material W/D*100 the ratio expressed in percentage, it is a moisture regain.

Now moisture content that means presence of water in material is expressed as percent of total mass of water. So W/W+D this is the total mass of material ok including water, in case of moisture regain it is dry without any water. So that is the express in percentage and this are the relationship between moisture content and moisture regain. If we know moisture regain quick and convert it to moisture content by the moisture content equal of moisture regain/1+moisture regain/100.

Similarly moisture regain we can calculate if we know the moisture content by moisture content/ 1-mositure content/100. So, this from this equation we can derive this simple equations.

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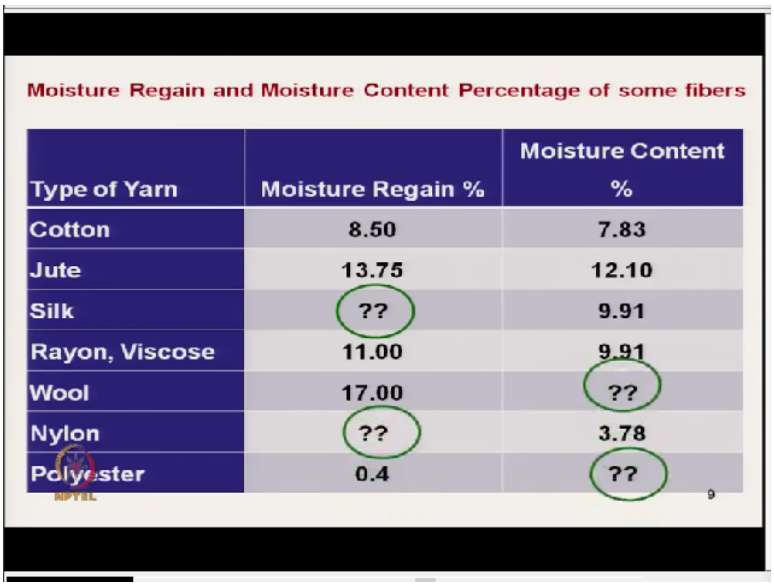

Now let us do some numerical very simple numerical, so moisture regain and moisture content percent of some materials have there. Let us see these are standard materials ok now if we know the moisture regain of cotton we can calculate the moisture content by using earlier formula. If we know the moisture regain, so moisture content we can calculate. So this is the moisture content and moisture jute moisture.

So, as numerical value moisture regain is little bit higher than the moisture content. So these are the now if we know the moisture content of silk as 9.91 we can calculate the moisture regain value using those equations. Viscose, rayon has 11% and 9.91 ok similar to silk and silk wool we can calculate nylon moisture regain we can calculate if we know the moisture content. In this way we can calculate for many other fibers now this things we can we should be able to calculate.

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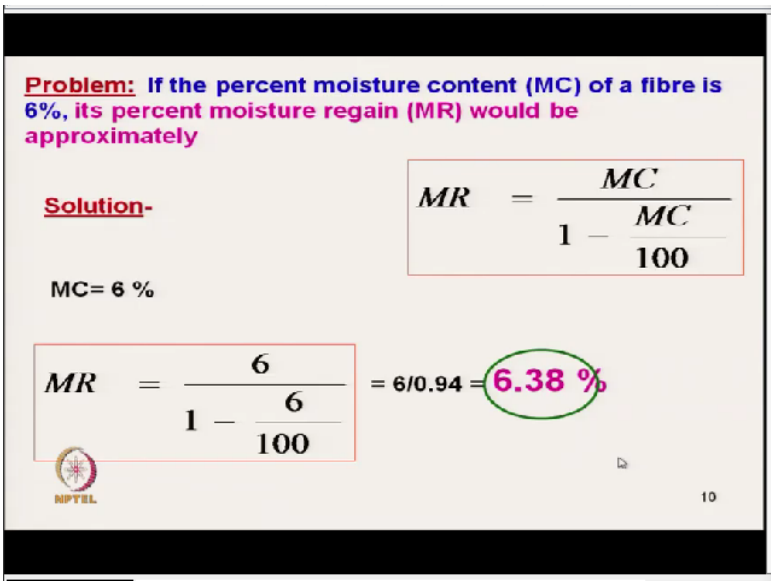

Now the simple numerical if the moisture content of a fibre is 6% it is percentage moisture regain would be approximately just simply use the formula moisture content is known. And moisture regain we have to calculate, so this is the simple formula and which is coming out to be 6.38.

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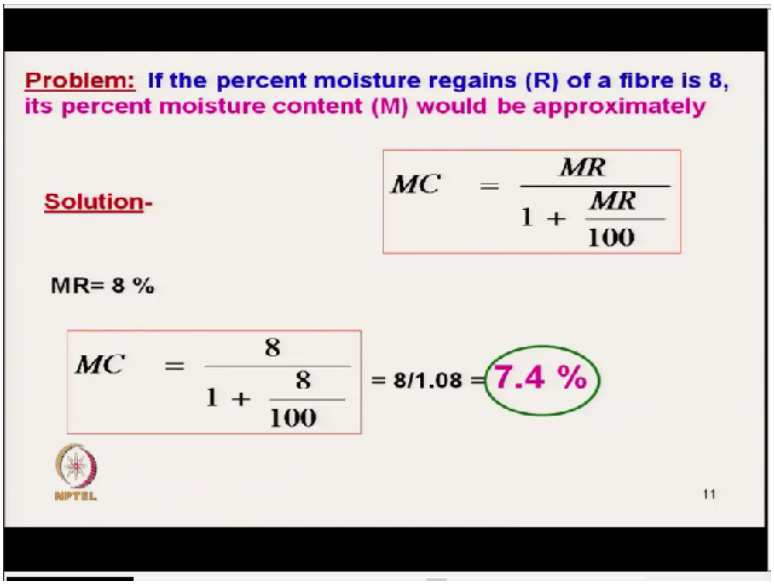

Similarly if we know the moisture regain there also moisture we can calculate moisture content. So, if the percent moisture regain or if a fibre is 8% it is moisture content would be, so moisture regain is 8. So, moisture content will be 7.4% ok, so in this way we can just calculate the moisture content and moisture regain.

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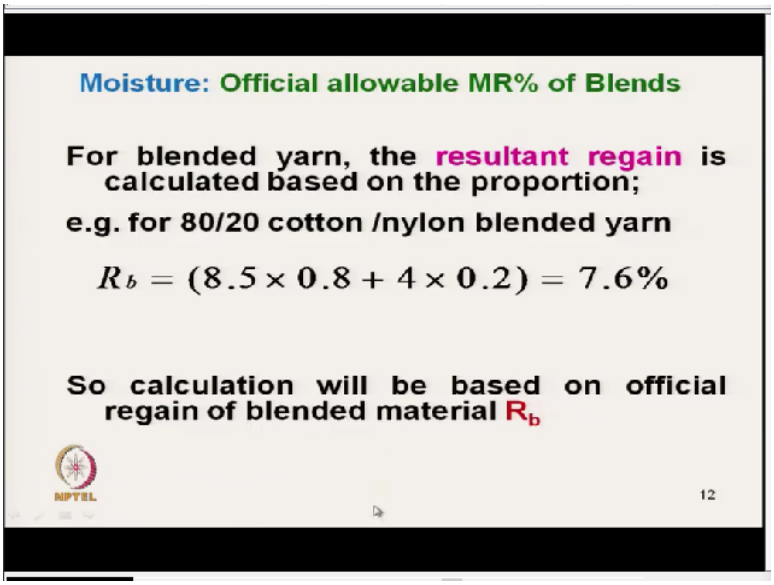

Now official allowable moisture regain of blends. Now earlier table what we have seen it is a table of 100% fibre that is see as I have mentioned we cannot have practically any material without any textile material without moisture. So except like fibre which has got 0% moisture regain that is different issue but for other material suppose cotton if I want cotton material cotton cloth without any moisture it is not possible.

Because it will absorb moisture from the material from the it will absorb moisture from the atmosphere ok. Now if we know the moisture regain of individual fibre we can also calculate the moisture regain of blends knowing the proportion, it is a simple equation for blended yarn the regain the resultant regain is calculated based on the proportion ok as for example. So, for 80/20 cotton nylon blended yarn if we know the moisture regain of cotton 8.5% that we have seen in the table.

And for nylon it is 4% and as it is 80 20*0.8 and for nylon this multiplied by 0.2 we will get the resultant regain of the blended yarn. So, this is the calculated regain and that we use for blend ok for calculating different mass ok, calculation will be based on the official regain of blended material Rb. So, we calculate based on the official regain.

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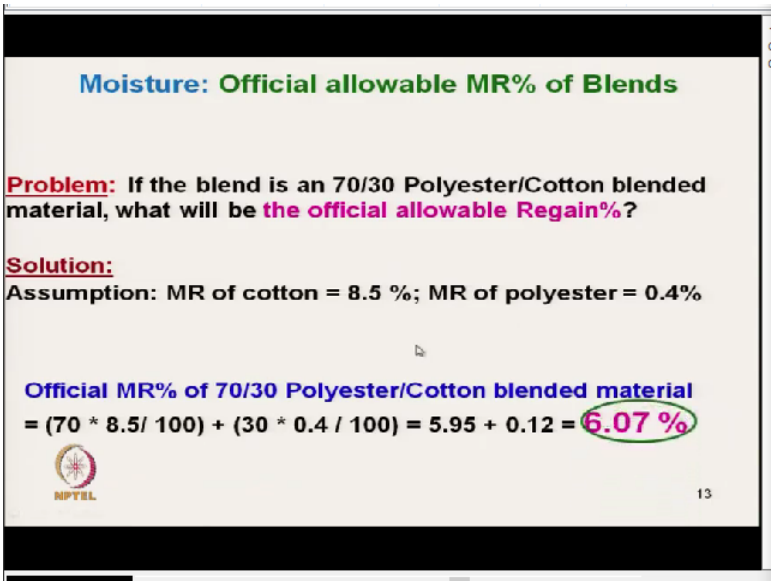

Now let us try to calculate the allowable moisture regain of textile material. So, if the blend is an 70/30 polyester cotton blended material ok. What is the official allowable regain? ok. It is simply we will use the formula we know the official regain a polyester we know the official regain of cotton, so it is a 0.4% and 8.5%. So, it is a polyester moisture regain is 0.4% and cotton is 8.5% then we can calculate the official regain of 70/30 polyester cotton blended yarn.

In the same way as we have done earlier it is coming out to be 6.07% and all the calculation all the wet calculation we have to do based on 6.07% ok.

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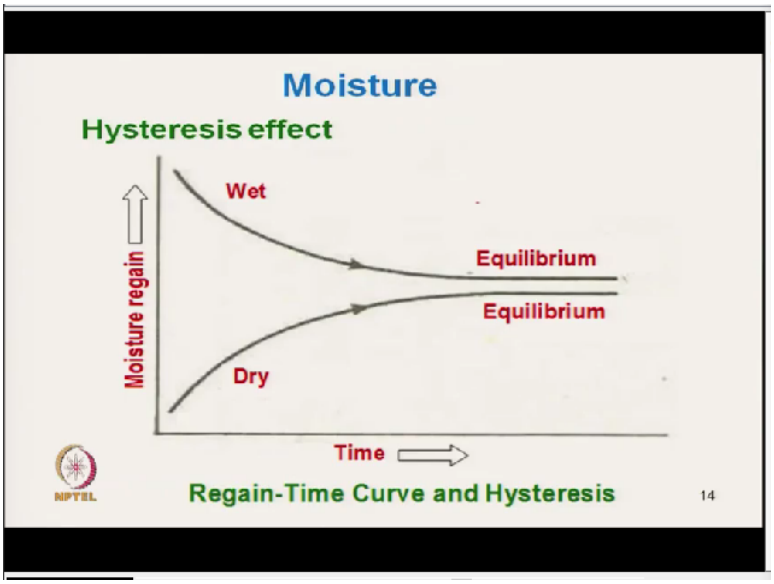

Now next is that it is a hysteresis, moisture hysteresis it is a very important phenomena to understand the presence of moisture in any textile material.

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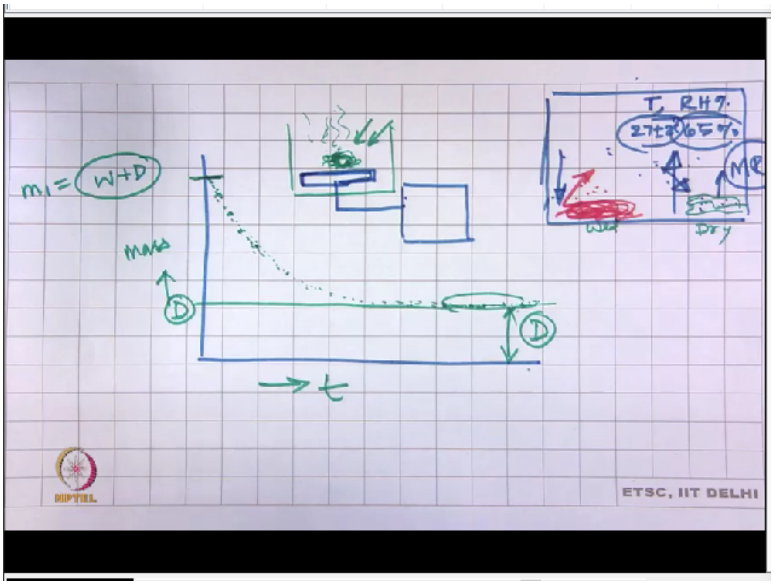

Now suppose at certain condition this is the room, in a room we have kept 2 cloths one is completely wet cloth, another is completely dry, dry cloth. And we have to kept at certain humidity, so the certain room of certain temperature and humidity percent, let us say it is a standard humidity verses 65% humidity and room temperature is 27+-2 degree Celsius ok in this room we have kept what will happen?.

The thing what will happen that the this dry material will try to gain moisture from the atmosphere ok and will the it is moisture regain will increase gradually. But whereas the wet material will try to lose release the moisture to the atmosphere, it will gradually be dried. Now the thing is that it is moisture regain it is increasing and it is moisture regain must presence of moisture is reducing and if we keep it for longer time we will see the there will be some difference in moisture regain between wet material and dry material.

Wet materials moisture regain will be little bit higher always than the dry material and this phenomena is known as the hysteresis of moisture. Now here the dry material it is gradually receiving absorbing moisture from atmosphere. Because atmospheric condition is exactly same and it is moisture is increasing ok. And here it is moisture is reducing and this line will for very

long time this will remain same for a particular condition ok. If we change the temperature and humidity of the room then it will be totally different but for same room so, that is this difference is known as the hysteresis effect ok.

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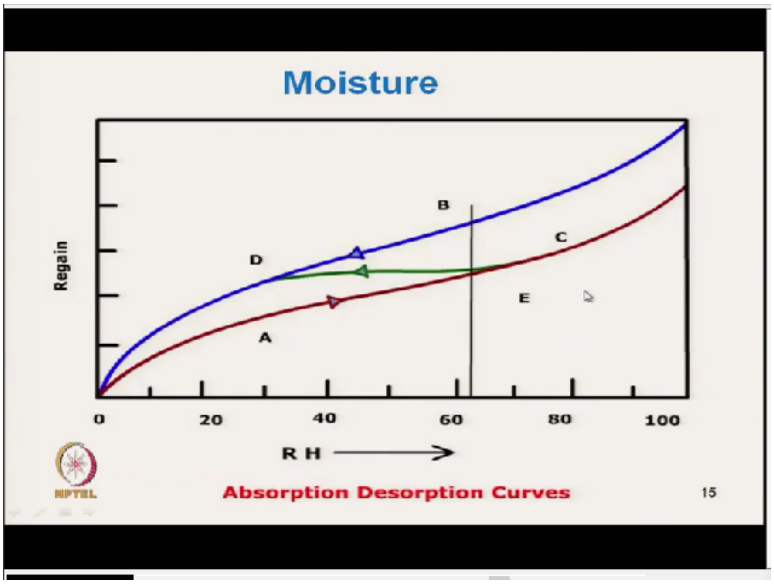

And another condition here it is a suppose we are what we have done in red colour we are increasing the moisture ok increasing the moisture up to this point ok up to this point we have to increase ok. Now from there on its moisture means relative humidity we have increased of the room. So, that moisture regain is increasing ok. Now when once we reduce the moisture relative humidity of the room from 80 to 70, 70 to 60 in that way, it has been absorbed that this curve the moisture regain curve will not follow the same path.

It will be little bit always in the higher site, this is also this phenomena it is moisture absorption desorption curve it is also example of moisture hysteresis. So absorption desorption curve will be same always, so desorption curve will be little bit on the higher side ok.

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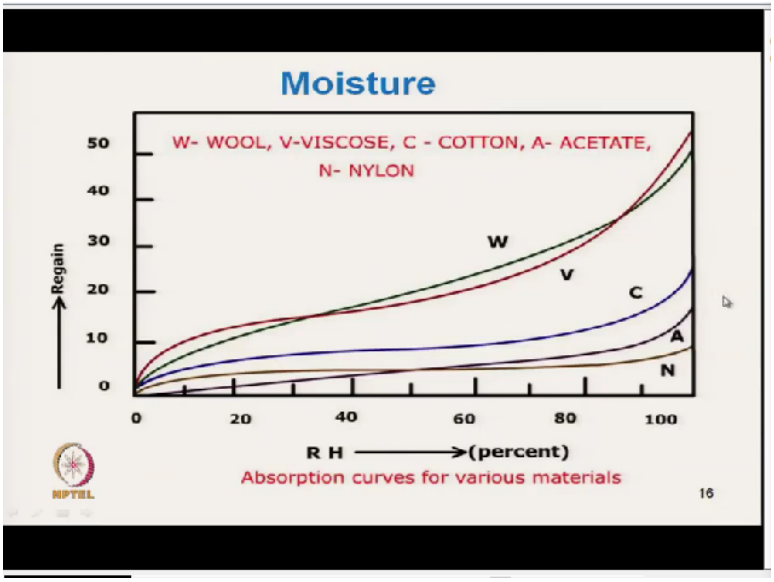

Now these are the typical moisture regain curve, so at different moisture **re** regain if we increase the relative humidity of atmosphere different material will have different regain value. Now that is why we must specify the moisture regain at standard condition. So, whatever moisture regain we have seen earlier those are at standard atmospheric condition that is 65% relative humidity. If we increase the relative humidity of atmosphere though obviously the regain will be high ok.

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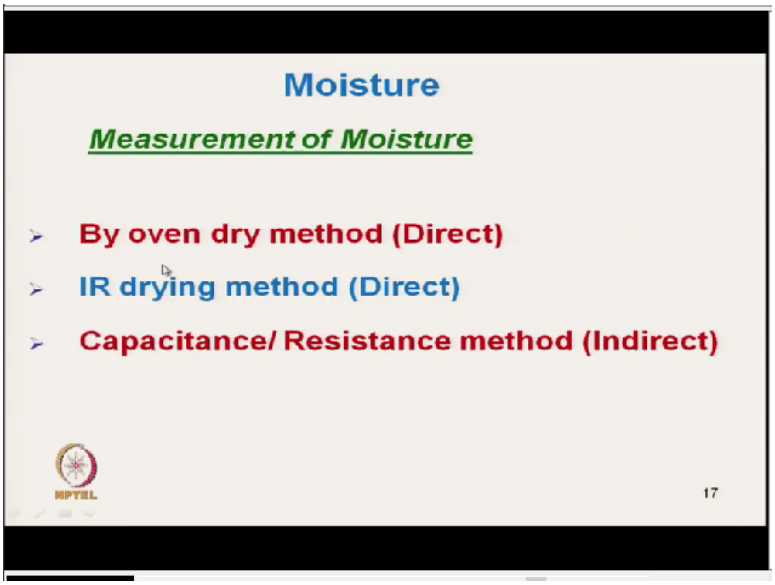

Now how to measure the moisture content, so moisture measurement it is very simple we actually follow 2 methods. One is that it is by oven dry method basically 2 methods we follow, one is directly take the material and then we dry the material in oven to make it bone dry, that is

total dry material D value we get. And then we know the actual mass of the material and difference will be the water content.

And from there we can calculate the moisture regain or moisture content, second is the it is a quicker method is the oven dry method is it is a slower method it takes time. But infrared drying method it is directly what we do? So, there is a weighing balance, weighing balance connected with the that is spinal ok computer ok this is the computer. Now here we are placing our material this is the material and the computer will give will take the mass of the material suppose this is the mass.

It is showing the curve, so this is the mass of material which is the W+D ok water+weight. Now this is the moisture m1 now after that will actually the infra red drying it is this is under in the chamber of infrared drying chamber, from there due to infrared drying this moisture will get evaporated as moisture is getting evaporated. This mass is gradually reducing this is be the time and this is the mass.

So it is reducing, so after certain time when the material is totally dry then there will not be any change in mass. So, it will be for certain time this will be, so will keep on taking repeated, the computer will take keep on recording the data. And it will compare with the previous data, so after certain time when the there is no change. So, as it is comparing with the previous data, so after repeated comparison.

So, if the data there is no change then this mass will be it is it will be D. This is the dry mass and computer will record the W value, D value W+D value it is recorded and automatically it will convert it to moisture content on my study here so using the simple equation. And third is the it is the indirect method this 2 methods were direct measurement direct taking the mass of the moisture. And second the third mass is the using either capacitance or resistance method it is a indirect method that means the presence of moisture in the material reduces the resistance value.

It changes the capacitance value, so that reduction in the change in resistance or capacitance is directly proportional to the moisture content. And this every all these instruments they have been

actually pre-calibrated and there are probes that probes simply at, so that can be actually this there are different types of probes available in for this type of moisture tester, probes available for raw bell for bell up cotton or bell up fibre use fibre or package form, in cone form or even from the surface from the fabric surface.

The there are different types of probes available but the principle is either capacitance or resistance change which is proportional to the content of moisture, moisture presence of moisture.

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So, this is one example this is the probes different types of probes are available, these are interchangeable probes and this probe if we penetrate inside the say cone and this will directly give as the value of moisture regain of the cone. So this different longer probes are available for say bell material we can get the data of moisture present inside the bell ok so different methods are available.

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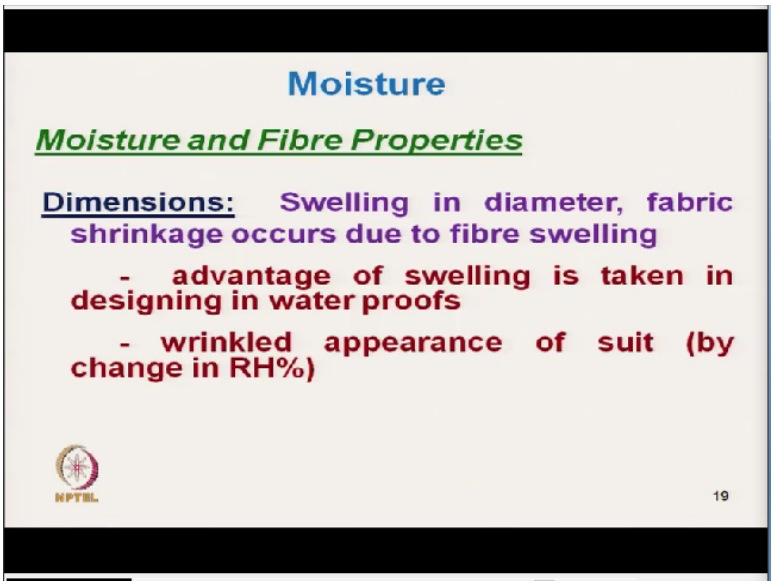

And now the fibre characteristics, so there the fibre properties are affected by presence of moisture, first is the swelling. The fibre gets swelled and most of the fibres after actually receiving the moisture, so swelling in diameter and fabric shrink that during the moisture absorption. So, shrinkage of fabric occurred due to the swelling of the yarn ok. Now let us see how shrinkage occurs.

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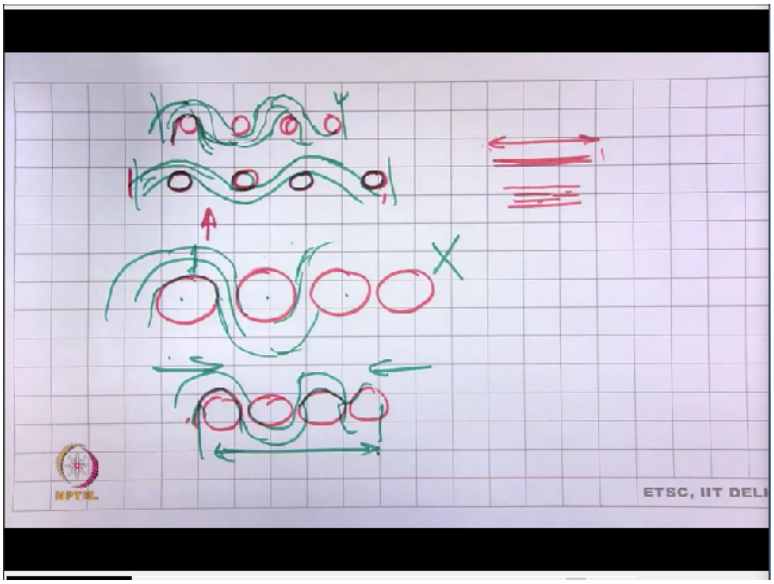

Suppose this are the one threads say weft threads ok and this is (()) (48:57). So I can put weft with the red ok this is water. Now when it is dipped into water say it absorbs moisture what will happen?. The diameter of fibre also the diameter of yarn will increase due to the swelling ok.

Now when once it is swell this yarn becomes say theoretically larger size ok. Now after swelling the fibres actually the diameter wise it is diameter increases.

But length wise it is not ok, length wise it is does not change due to the molecular alignment of the fibre. So, once it is the diameter increase but the length of yarn is not so weft yarn it is not changed, length being same. So, it will try to wrap around this, now what will happen in doing this? This has to follow loner path, but the length is same, so this will have inward force. This will try to pull this weft threads inside.

So, the instead of these what will happen?. This was the initial width this will become closer and in this way total dimension, this is happening in say what direction similar thing will happen in wet direction. So the total length is shorten, now this is the condition in wet condition now what will happen to the in case of dry condition. In case of dry con when it is dried again what will happen?. The moisture will come out and the diameter will again shrink to its original condition.

But as there is no other force which will extend this dimension will to some extent remain on that condition. So, what will happen?, the condition after drying will be like this instead of this it will be little bit lose types, so that actually that is how the due to swelling the shrinkage of the textile material most of the textile material which absorbs moisture it actually increases ok. So and the advantages of swelling is taken in designing the water proof like umbrella cloth.

We take the this advantage of swelling, so, when in dry condition there will be some pores but once it absorbs moisture it gets it is swelled. And then the pores are blocked, so water proof designing we take advantage of this technology, this principle, another is the wrinkle appearance of suit what happen?. If we actually if we test if we stitch sorry if we the wrap against the weft, in that case what will happen?.

The wrap shrinkage and weft shrinkage will be different at different humidity level. So, that means the shrinkage will be totally different at differential shrinkage will actually result wrinkle appearance of suit. If it is stitched at with wrap with weft or with different shrinkable material, so that is it is prominent when the relative humidity changes.

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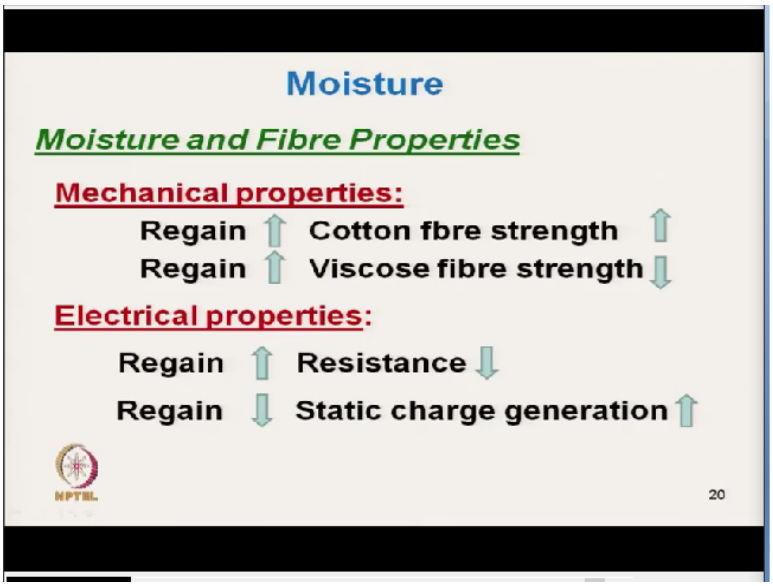

So, moisture and fibre properties, so that next is that the mechanical property with the increase in moisture regain the strength of the cotton fibre increases ok. There are some many queries one can go through but if we see in case of viscous it is just reverse. So for if we test cotton at in the wet condition the it is it will show higher strength. But in case of viscous it drops similarly electrical property with the increase in moisture regain the resistance electrical resistance reduces ok.

So that using this principle as I have already mentioned if we use this principle and then we can design instrument measurement of moisture regain of textile material. And also the regain affect the static electricity generation. Now this is the problem this static generation problem it is very severe in particularly in spinning where we process the synthetic fibre. Now normally synthetic fibre their moisture regain is low.

And in case of dry condition if the humidity in the spinning shed spinning mill it is low. So, it will start generating the static electricity and there will be different problems which will occur that is one of them is roller lapping, so various problems will occur ok. So, we will continue this discussion in the next class ok, till then thank you.