Evaluation of Textile Materials
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Lecture-36
Evaluation of Yarn Evenness (contd…)

So, we will continue with this variation length curve, so it is called BL curve and there are 2 types of variance length curve it is one is called between length which is called BL another is within length is denoted as BL curve.

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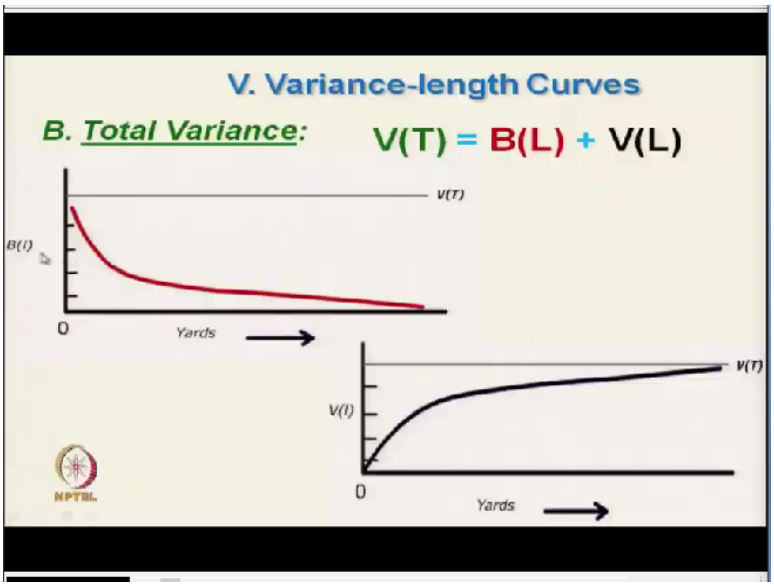

So, BL curve and as the yarn cut length increases the between length reduces, on the other hand as the cut length increases the variance within length increases. So, effectively the total variance is the summation of between length and within length ok. Now we will see one practical numerical the problem is here.

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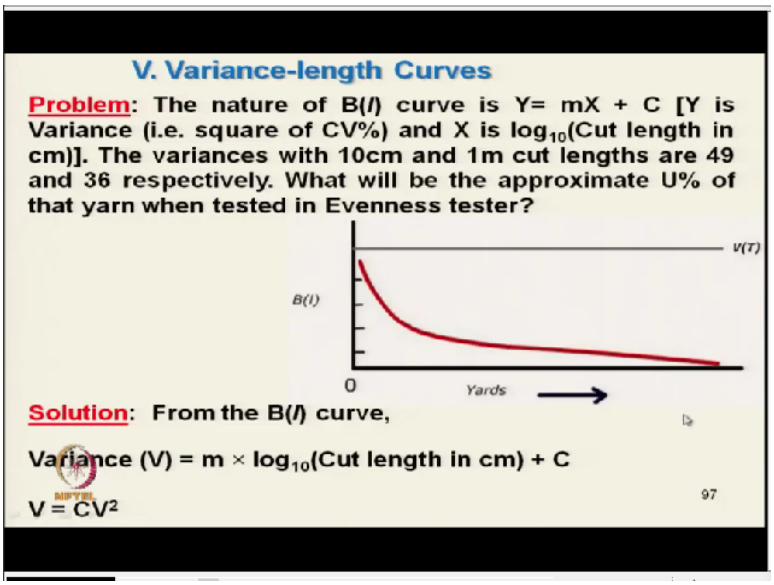

The nature of B(l) curve is given it is a logarithmic curve ok. So, which is mX+C where Y is in Y is the variance square of C%. And X is the log of cut length now here although this is the shape of the curve now we can form curve where Y-axis is in log. If we have the logarithmic value then the curve will be typically it is a straight line curve. So, many manufacturer they have programmed it is a in the logarithmic curve not in this form.

But in the logarithmic value which gives the shade line. So, BL curve is normally the in the log form ok. So, here it is a shade line with the X-axis log of cut length and Y-axis is the variance ok and the variance with 10 centimeter cut length. And one meter cut length are 49 and 36 respectively that is given. Now with this variance ok now the thing is that what is the actual problem?

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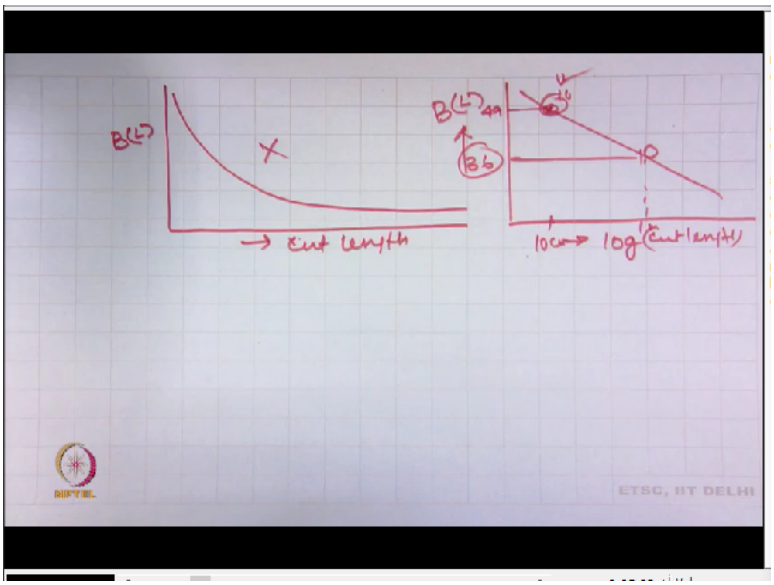

It is very practical problem here now we know that this is the BL curve it is a length cut length but if we take the cut length in logarithmic form normally we get the printout in the logarithmic form. And BL, so this curve will be like this ok this is the curve and the in the instrument they give this type of print not this type of print out. This is the print out now looking at this here the problem is that at certain cut length.

So, at 10 centimeter cut length here the BL value, so 10 centimeter cut length so, BL value is say here it is given 49, so this is 49. And at say 1 meter cut length here it is a 10 centimeter and this is say 1 meter cut length. The BL is 36 now looking at this curve 2 pints are given can we predict the value of U%. So, we have this 2 data we have the nature of cut now can we predict what will be the U% of this yarn that is the problem ok that is the our problem here.

Now respect to what will be the approximate U% of the yarn when it is tested in evenness tester. Now from BL curve we can try to predict the approximate U% now this is the BL curve. And from BL curve the variance equal to m log10 cut length ok+C that is the equation it is given. And V is nothing but CV% ok.

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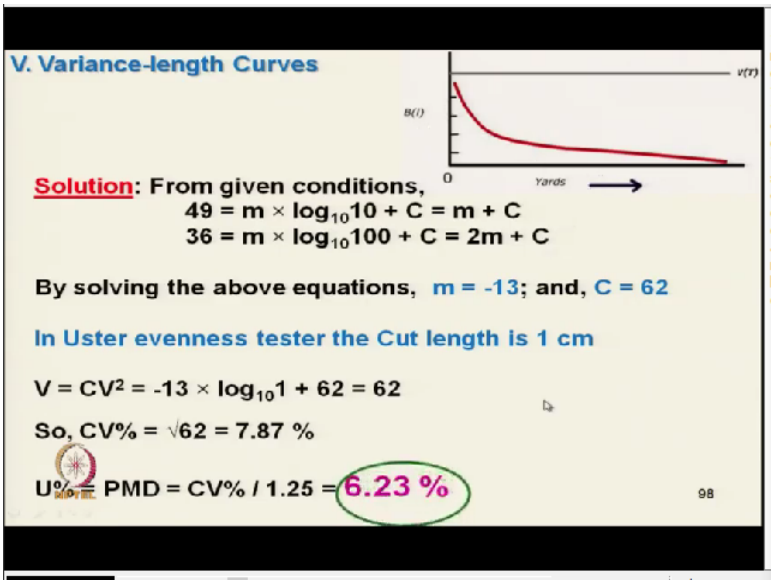

From given conditions the 49 is the variance m with the cut length of 10 centimeter+C the m+C log10 is one m+C equal to 49. And for 1 meter cut length 1 meter means 100 centimeter 36 m log100+C equal to 2m+C, from this 2 equations we can measure the we can get the value m and C. So, by solving this equation m equal to -13 and C is 62. Now problem is that we have to see the evenness tester as we have already mentioned in last class.

In evenness tester the U% is given where the cut length is 1 centimeter. So, can we measure the variance for 1 centimeter cut length yes we know the equation. So, this is the an Uster evenness tester cut length is 1 centimeter approximately we can to calculate, so V equal to CV% equal to m log1+C say 62. So, log1 means 0, so it is becoming 0. So, it will be 62, so CV% CV^2 is 62 we can calculate the CV% it is a under root 62 7.87% is the CV% with the cut length 1 centimeter.

And if we want to know the Uster U% then it will be CV%/1.25, so the yarn will have approximate U% 6.23%. So, from BL curve, from BL curve we can actually predict the value of Uster % ok. So, we can get the 2 points and from there we can always calculate ok.

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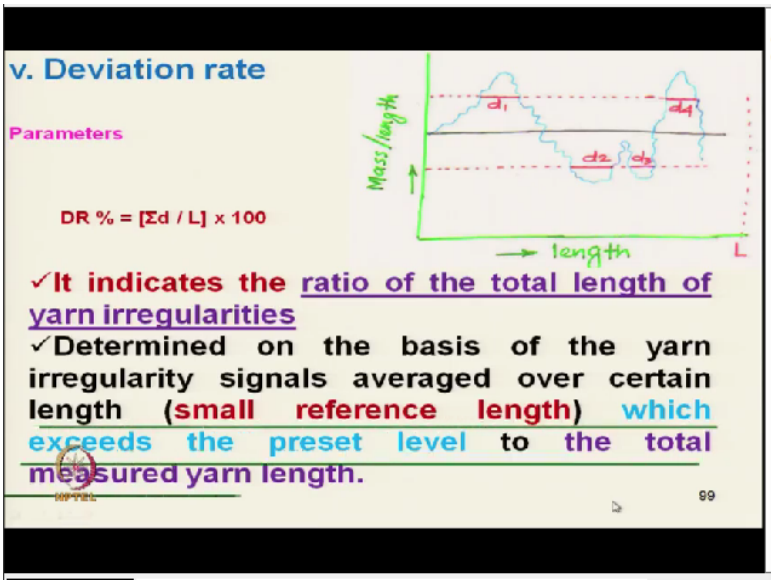

Another way of expression of variability is called deviation rate, deviation rate is nothing but it indicates the ration of the total length of yarn irregularities this is the definition. It is a ratio of total length of yarn irregularity that means this is the yarn irregularity plot ok mass/length. Now here we have certain reference length like what we tell? The DR% of 50% and more, so this is the yarn, so this is the mass/unit length which is 50% or more than the mean mass/unit length.

This line has been plotted we can have different range, so 75% we can have or 30% we can have this dotted lines are say 50%+50%,so more than 50% what is the total length of yarn? This length this d1 length is the length of the yarn which is more than 50% of the which that length of yarn which have being 50% or more mass/unit area mass/unit length. This length here d2 length this length have being the mass which is +50% or more d3 length, d4 length this is the actual length of the yarn where it is actually the mass is more.

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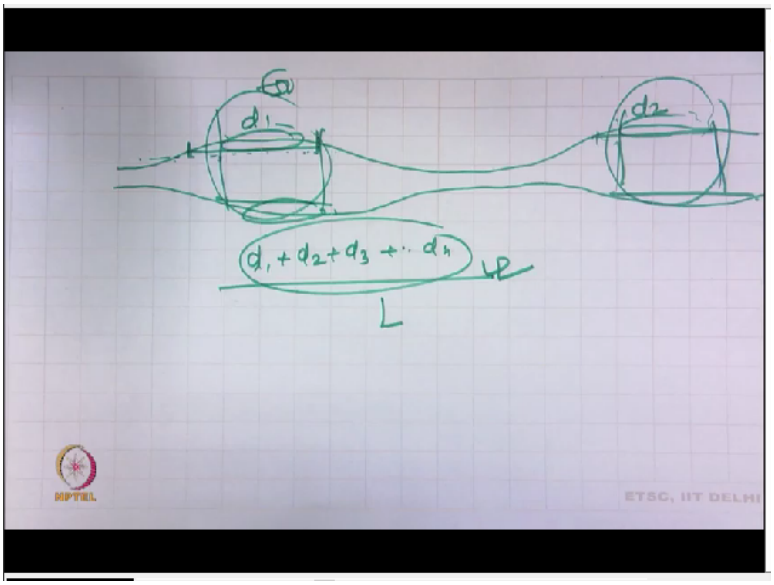

Now physically if we see suppose this is the mass mean+- +50% and above. This length is mean +- +50% and above, so this length is actually measured this is d1. Another portion here this length d2 this length is having mass+50%, in this way we will keep on adding d1+d2+d3 only those lens portion of yarn length of those portions of yarn where the mass/unit length more than 50%.

This we have added then it is divided by the total length of the yarn tester. So, this gives an unique idea of the physically what will be the defect? How the defect will look like? Ok. So, this is one parameter determined on the basis of the yarn irregularity signal averaged over certain length small reference length which exceeds the preset length. We have to set the preset suppose I want stricter norms. So, instead of 50% we make call it at 40% what is the effect? Or may be 60% at different label we can calculate and it is on the total length of yarn tested.

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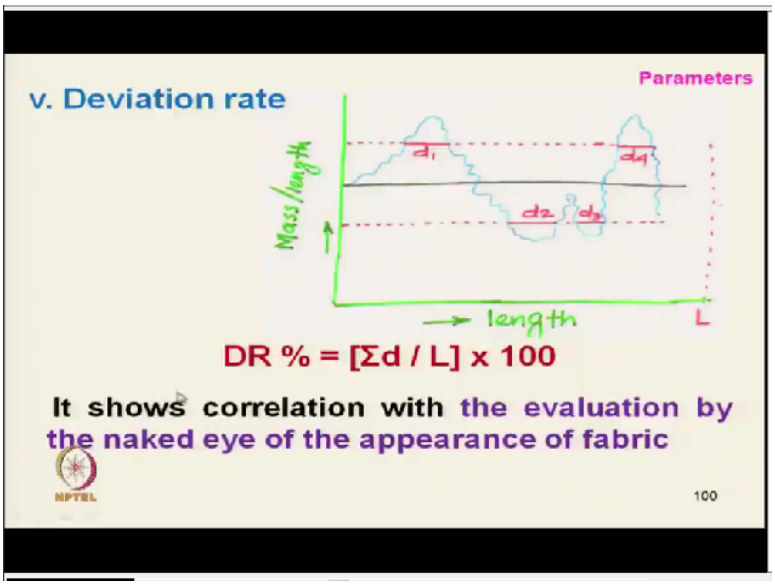

So, DR% it shows the correlation with the evaluation by naked eye. So, it shows the actually the appearance from this value DR%, higher DR% means the yarn actually loop total that total unevenness looking will be there actual appearance of the fabric will be patchy fabric ok. So, that it gives idea DR% will give idea the type of loop the fabric will give, the other like U% will not give this idea which U% will only give the ok this fabric will be having inferior look.

But this DR% will give the total idea of the thick portion which will come up in the appearance. Now will see another way of measurement of unevenness.

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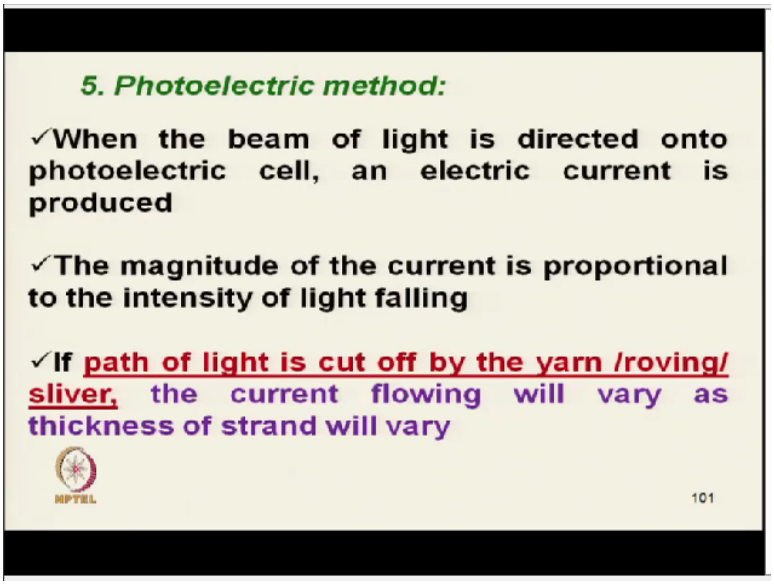

It is a photoelectric method when a beam of light is directed onto a photoelectric cell and electric current is produced ok that is the technique we have seen earlier also for other type of measurement. The magnitude of the current is proportional to the intensity of light falling on it. And if the path of the light is cut off by yarn/roving/sliver the current flow will vary depending on the thickness or diameter of the yarn. So, it does not measure the mass variation it measures the diameter variation. So, this is the technique here.

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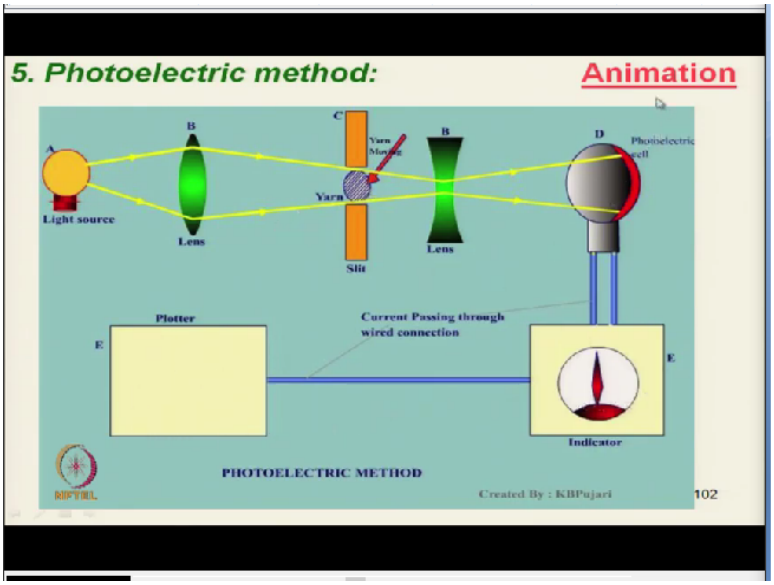

Here this is the light source lens arrangement is there this is the slot is there at yarn is passing through this. And depending on the diameter of the yarn the light will pass through this and it is in photoelectric cell. This will detect the amount of light which is proportional to the diameter of yarn and as the yarn moves this will record the variation in diameter.

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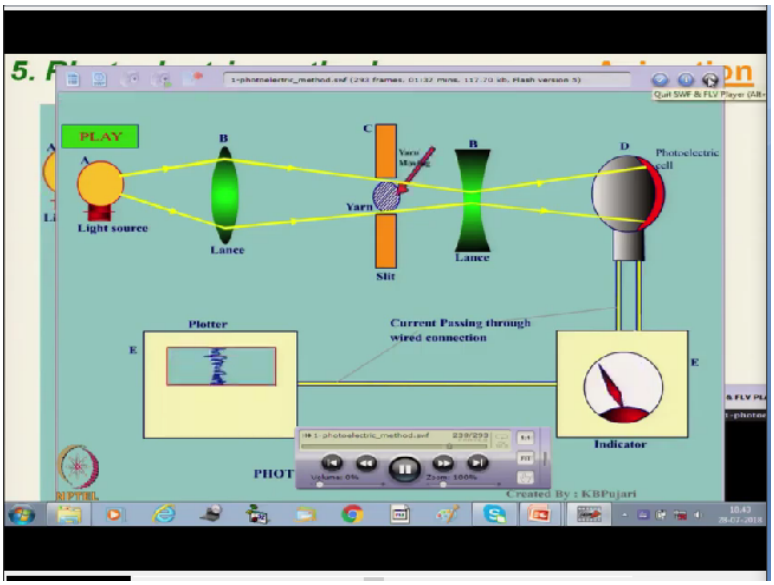

So, we can see here by this animation, so light is moving through and it is without any material. So, this is there is no material it is there now it is material is there material is flowing that is moving ok yarn is moving. And then light is falling on it ok photoelectric sensor will sense the amount of light which is proportional to the diameter of the yarn as yarn moves the diameter varies at different location depend position.

And so it is showing the current variation and that will get and that we can actually plot this variation which is proportional to the variation in yarn diameter ok. So, this is the type of plot we can get this is the plot we can get this is showing the variation in diameter. And then we can calculate the variability.

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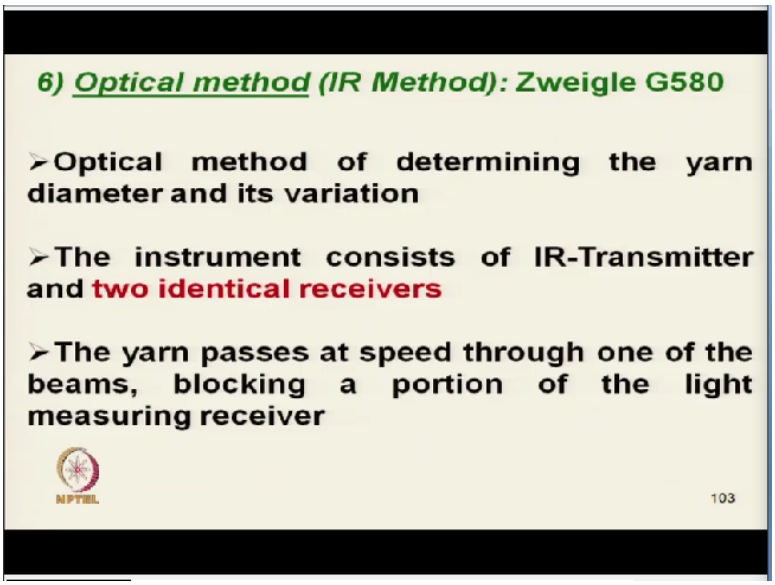

Next is that another optical method which is infra red method Zweigle G580 model which is actually it is optical method of determining the yarn diameter and it is variation. And the instrument consist of 2 IR-transmitter of in identical in nature and identical receivers will be there and one of through one the ray ok. The yarn will pass it will be blocked partially and the it will be compared with the reference receptor.

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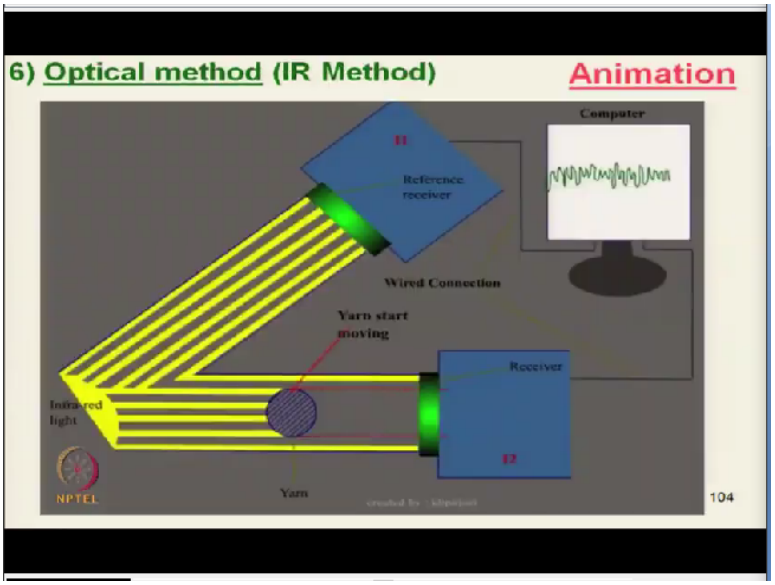

This is the here the same infra red light of same intensity is passing through 2 receivers are there. In one receiver this is the reference receiver and this is the actual receiver it is giving I1 the actual the intensity of light it is getting here I2. And I2 value is less than I1 because it is a

partially it is blocked by the yarn and the difference which show the actual yarns diameter variation. So, this is the simple technique here.

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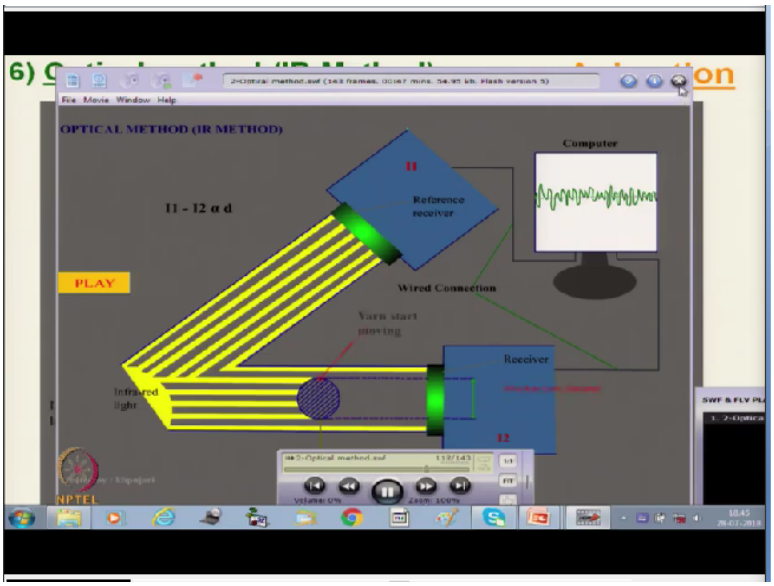

The same intensity light to light beams are going one is yarn is blocking here now yarn is moving and it is a the moving yarn depending on the diameter variation it is giving in the plot ok.

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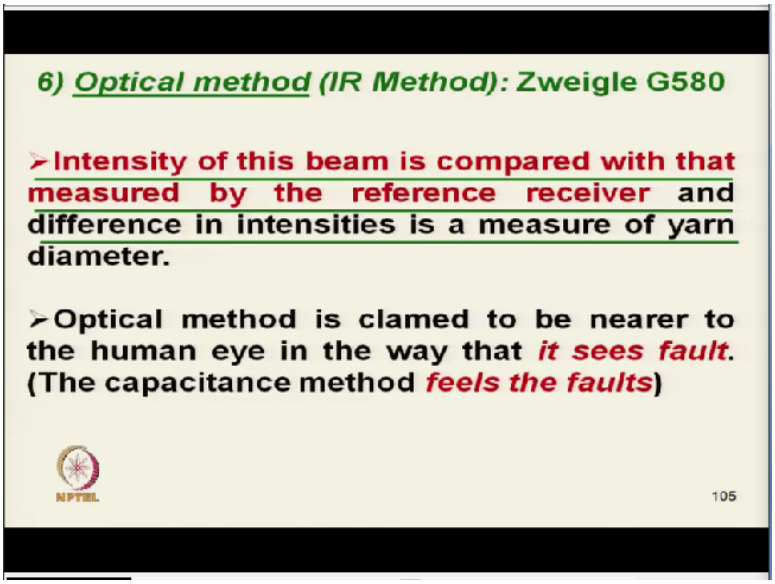

So, intensity of this beam is compared with that measured by the reference receiver and difference in intensity is measured it is a measure of yarn diameter ok. And that the optical method is claim to be nearer to human eye in the way it sees the fault ok. And capacitance

method it feels the fault, so that is how we have discussed earlier that the positive and negative points of this 2 methods.

Here it is claimed that this value here whatever evenness value we are getting it is directly reflecting the actual appearance of the cloth.

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Next is that the yarn fault classification, although the principle is same as that we have seen the are capacitance type of method. But here we do not measure the thick thin or neps, thick, thin, neps are actually inherent nature inherent characteristics of yarn. This thick, thin, neps we cannot eliminate we cannot take out from the yarn because they those are very frequently occurring. We cannot we can only try to minimize those ones.

But the there are another type of faults which are in larger dimension but this faults are not due to the inherent nature of the material or inherent problem in the machine setting or other things. But these are due to some external mainly due to some external result for but due to some measure machine faults ok. This can is this are not at all acceptable at least some measure faults we have to remove.

These are called objectionable fault the yarn imperfections which have greater than the size more than 100% of the mass and longer in length or both or called as at as a classified as the faults.

But the imperfections are less than that ok and the length wise imperfection are smaller ok. Imperfections are more frequent while faults are seldom events faults have greater impact on performance of yarn or appearance of yarn.

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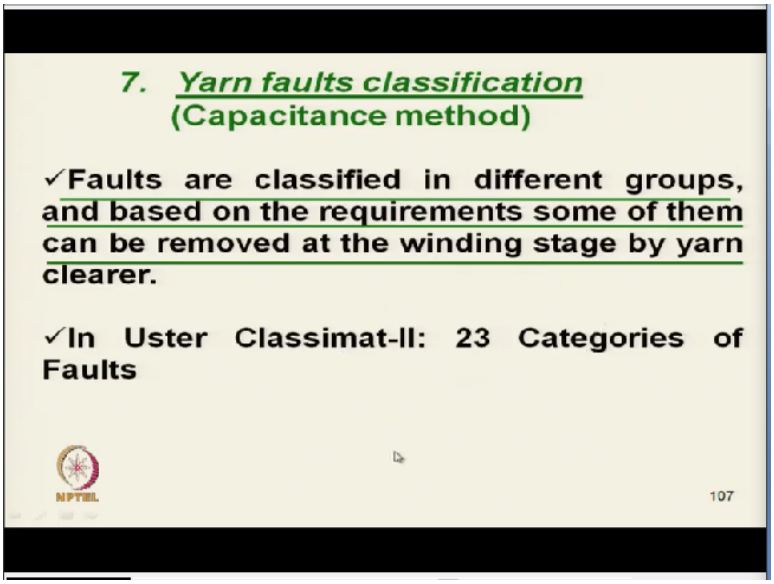

Faults are classified in different groups like imperfections will classify thick thin neps even thick are different person. So, here also it classifieds at different group but in fault we along with the diameter or mass/unit length. We classify in terms of length of the fault ok best on the requirement of some of them can be removed in the winding operation ok by using clearly. So, there are different model different manufacturers of there of this type of classifier. So, Uster classimat-II which is older version it has got 23 categories of faults.

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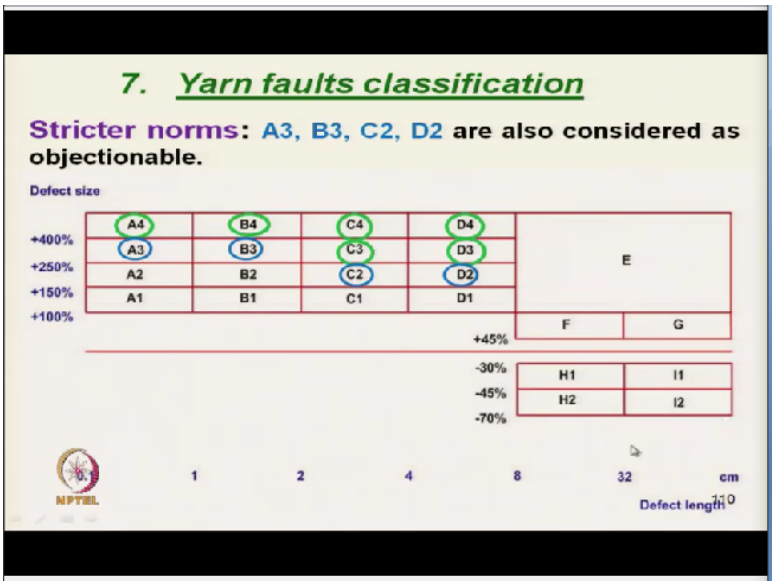

These are the categories starting from A1 to D4 this are called thick faults ok. This are called thick or slab A, B, C, D ok this are basically this shows the length of the fault ok like 1 centimeter, 2 centimeter, 3 centimeter, 8 like this are the length of the faults. And **I** levels 1, 2, 3, 4 are the diameter or mass/% the mass/unit length ok the like A1 means the fault which have being 1 cent up to 1 centimeter length.

And +100% that means 2 times of the mean mass/unit length where as A4 means the thickest amount A group that means any length up to 1 centimeter. And it is mass/unit length is +400% that means almost it is 5 times of the mass it is a very thick fault ok. Similarly if we right way B, C, D the length will be increased. So, D4 the length is up to 8 centimeter and that is the 8 centimeter long and diameter is, so mass/unit length is 5 times of the average.

So, this is and E is called long slab ok here the length is between 8 to say 8 and above this is the length. So, very long slab this is highly objectionable fault and short thin faults are like F1 F and G are the thick fault. But they are not that thick in terms of mass/unit length but there long thick fault, this are F and G are long thick fault and H1 I1 are long thin faults and H2, I2 are long thin faults. But the diameter are mass/unit length is much less.

So, if we see the severity of fault is E is the actually it is a thick faults and I2 is very thin fault if we see the if we tell the which the question if we ask which fault is responsible for breakage in

subsequent process. This will be definitely I2, H2 this will be maximum this will with the reason for the breakage which fault is responsible for very high slab appearance E fault or D fault or C fault. So, if we see the objection ability objectionable faults are either very thick or very long faults.

These are objectionable fault and we can identify this A4, B4, C3, C4, D3, D4 this are actually objectionable faults because this are either thick or this are longer faults. E is always objectionable ok A4, B4, C3, C4, D3, D4 they are objectionable faults. And if we try to have some stricter norms if we want to have better quality yarn**.** And this faults can be removed in the winding process. And here we have to also see the number of breakage in the winding because one break means we are introducing one fault also.

We have to place, so if we want to have stricter norms they in that case A3, B3, C2, D2 can be A3, B3, C2 and D2 can also be considered objectionable fault. So, these are the you can add, so we can keep on adding the fault if we even if we can think the A2, B2, we can add that we can do. But at the same time we have to considered the efficiency in the winding because the number of faults are increase this are in cumulative form

So, A4 number of A4 faults are much less than A3 and A3 is much less than A1. So, A1, A2 there large number ok, so if we consider to remove A2 even then the number of stoppage of the particular working head will be very high. And number of cut number of splice will be very high that will affect actually indirectly adversely that will affect the quality ok. So, that is why we have to decide which what type of faults we have to remove. We may think ok we will work with B4, C4, D4, D3 then it is fine, so in that case number of stoppage will be less. And the DH1, H2 we can show I1, I2 we can see which one we can remove.

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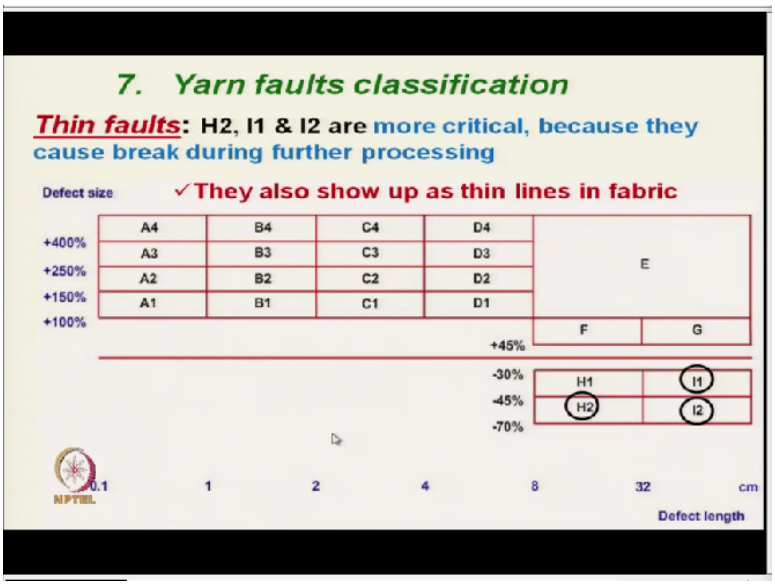

So, long thick faults E and G are objectionable**,** so this are objectionable we can always remove. So, E we can always we have to remove this faults. And thin faults H1, H2 I1, I2, H2, I1, I2 this are objectionable fault is this are more critical. Because they cause breakage during further process ok. They also show up in thin lines in this fabric, so we have to remove this faults.

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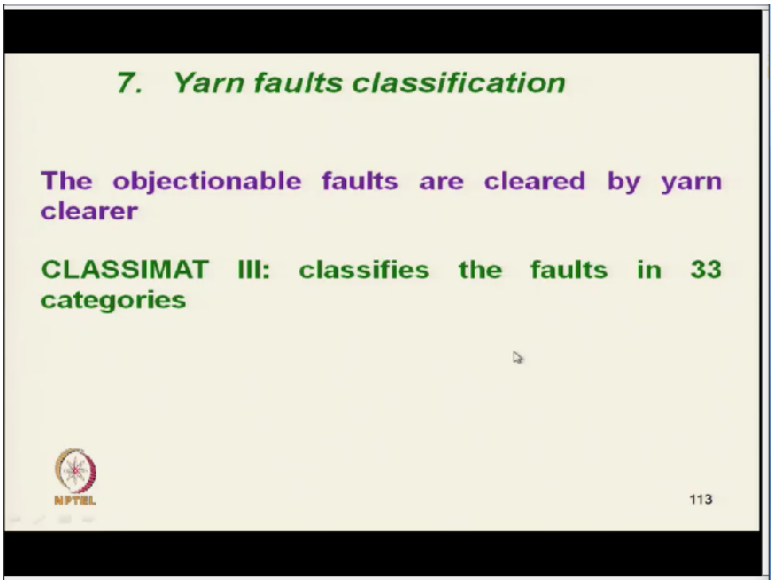

The objectionable faults are cleared by yarn clearer, so yarn clearer is set and there are some settings we can set the what type of faults we want to clean ok. And classimat III next model which is actually where instead of 23 types categories they have actually classifies din 33 categories that we can always 2. This is only matter of software ok we can always classify in more and more.

Because we have data once we are getting data from the capacitance type sensor we can always to, like another tester which is called KEISOKKI Classifault. They are it classifies 40 different categories.

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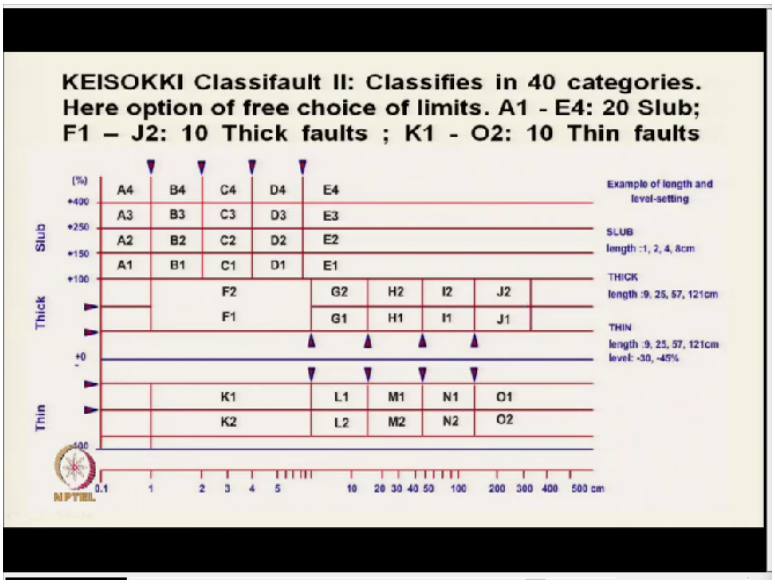

So, it is simply the software we can keep on adding the variability ok different labels. The basic principle is same.

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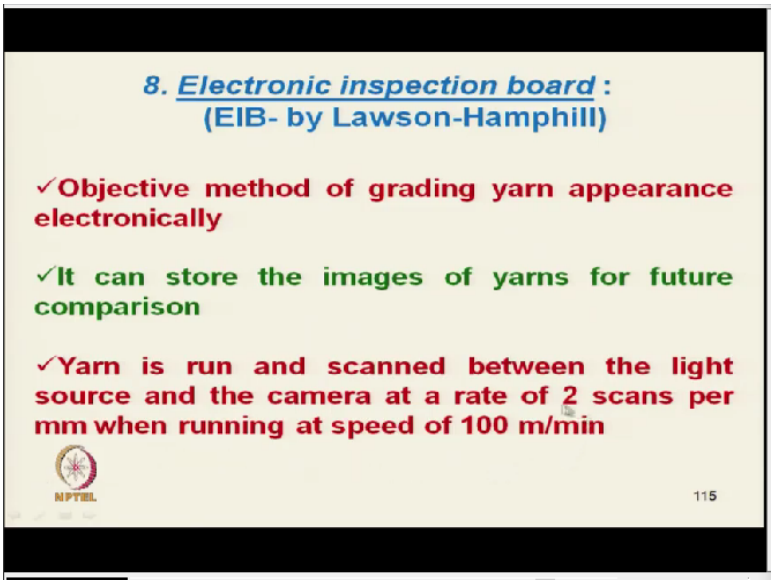

So, another instrument which is electronic inspection board, so where it sense in Lawson-Hamphill instrument, where it actually works in photoelectric principle. And objective method of

grading yarn appearance it stores the data yarn diameter data and automatically form the yarn board without as we have seen yarn board rapping. It will automatically form the yarn board and it will compare with the standard.

So, you do not have to do anything, yarn is run and scan between the light source and the camera at the rate of 2 scans per millimeter when running at the speed of 100 meter/millimeter.

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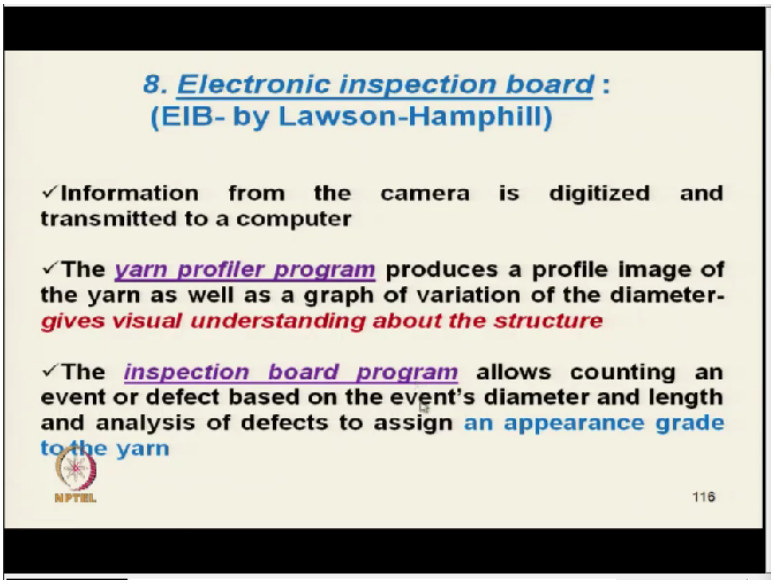

So, information from the camera is digitized and transmitted to the computer. Yarn profile program produces a profile image of the yarn as well as the graph of variation of the diameter. So, this profile program is there and inspection board program is there the 2 types of program one can have, so automatically it will form yarn board. And it will automatically be credit yarn appearance one, so you do not have to do anything with the standard grid.

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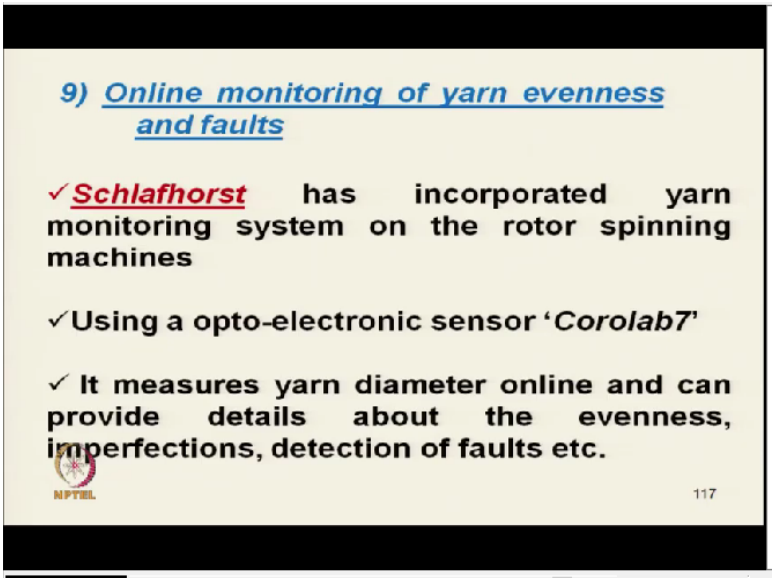

So, after that we will just try to finish quickly, so we can also measure the evenness or faults online. So, whatever things we have discuss or basically this were actually the offline techniques. We have to take the yarn or material from the machine and test offline. But there are techniques like in Schlafhorst the Corolab that rotor spinning machines there. They have fitted the optical sensor with each and every end each and every rotor actually rotor box ok.

And measure the variability of yarn online and immediately it gets signal in the central processor and detects the fault online ok. And identify the machine is producing the problem, earlier methods we have done it was basically it is a postmortem we already yarn produced we getting the values. And try to rectify for next process but this type of online process is actually it is very useful. So, that we can get online immediate we can rectify the problem.

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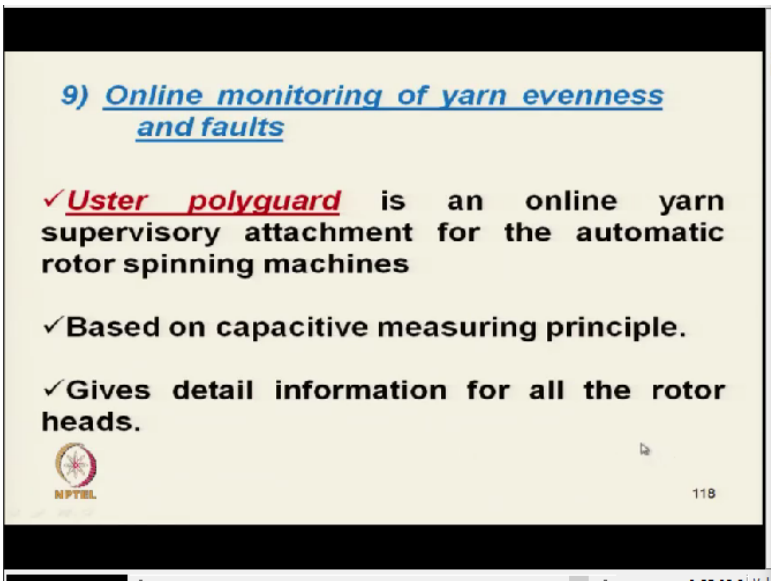

Uster polyguard also they are which works on the capacitance principle and it keeps the information on variability. So, with this we have to come to the end of the session evenness ok. In next session we will discuss the other parameters, other parameters means we have completed the **f** fibre we have completed fabric yarn. And now we will see test methods, testing techniques or fabric ok till then good bye thank you.