Evaluation of Textile Materials
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Module No.#02
Lecture No. # 05
Sampling Methods and Sample Size (Contd.,)

Hello everyone. In last class we have discussed the different types of sampling, like statistical sampling non statistical sampling and also we have discussed sampling of fibres that is loose fibres from bale. And we have seen that sampling from bale for cotton fibre is entirely different from that of wool fibre. Because the difference is the presence of grease in wool that is why that we cannot take the wool fibre that simply, okay.

So we have to use some other technique like coding technique we have discussed. And now today we will continue with sampling. And now we will discuss sampling of fibres from fibrous strand like sliver, roving or yarn. So from sliver if you want to take sample it is very difficult, difficult in the sense, we cannot take fibre actually unbiasedly. So, there will be definitely some by biasness. So, by biasness due to length so here, we have to see how to get the fibre sample which is unbiased.

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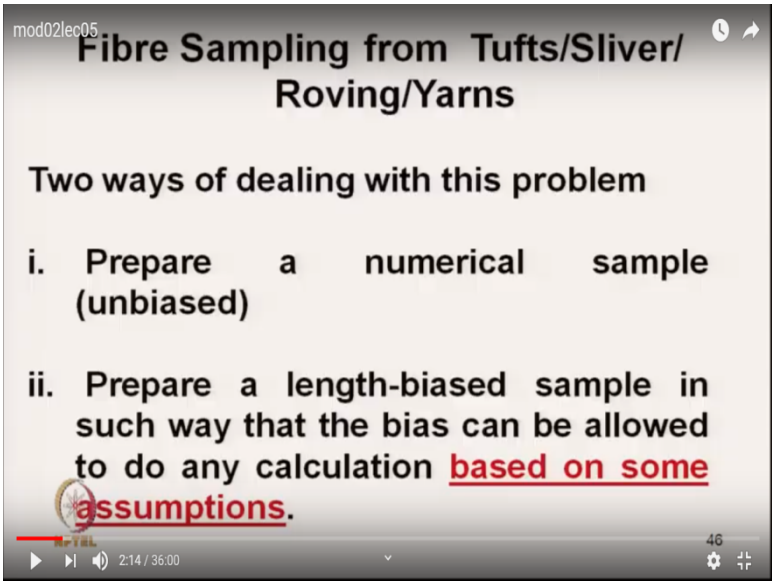

So there are two different type of sampling techniques we follow. One is called numerical sample. Numerical sampling which is totally unbiased. And another technique is that to prepare length biased sample and then we have to do some, we have to make some

assumptions. So that then in calculation, we can take care of that. Now in numerical sample as we have discussed in last class also, that the;

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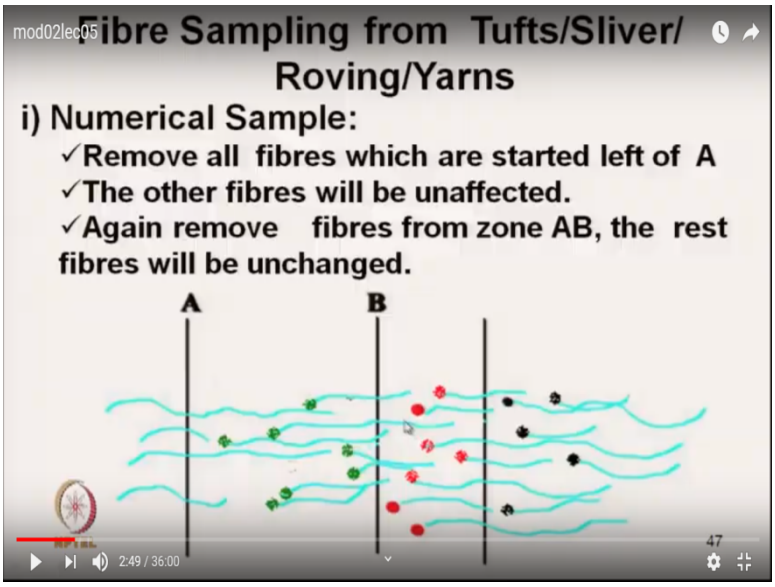

If we remove some fibres some portion of fibres, then that those fibres will not affect the proportion of the bulk remaining bulk. So removable of all the fibres that we started at left side of A. If we remove then the other fibres will get unaffected, will be unaffected once again. Again removable of fibres from A, B zone, that is the fibres with green tip will not affect the fibres with Red tip or black tip. So this will not affected.

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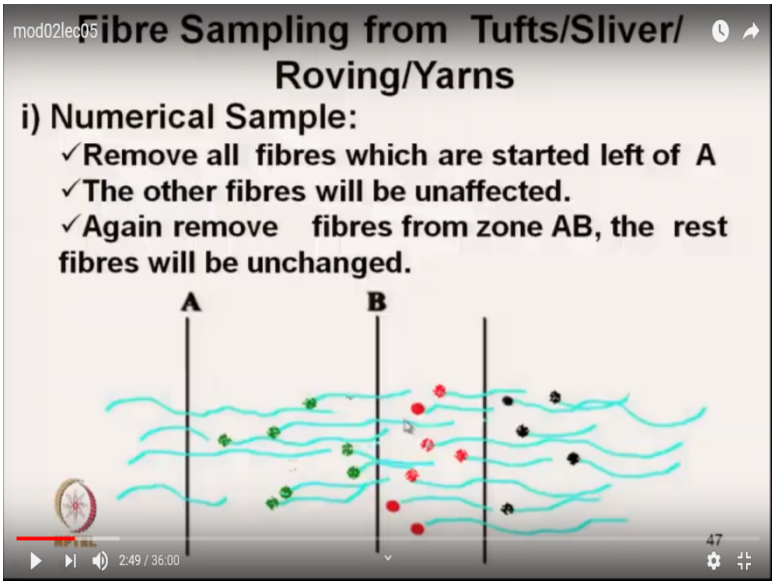

So, the definition of numerical sample is, if the removal of one sample does not affect the composition of the remaining samples, then it can be considered as numerical sample, okay. Each segment is representative of whole lot. So, that is the numerical sample. Now let us see

how to get the numerical sample and also in the length biased sample. In length biased sample.

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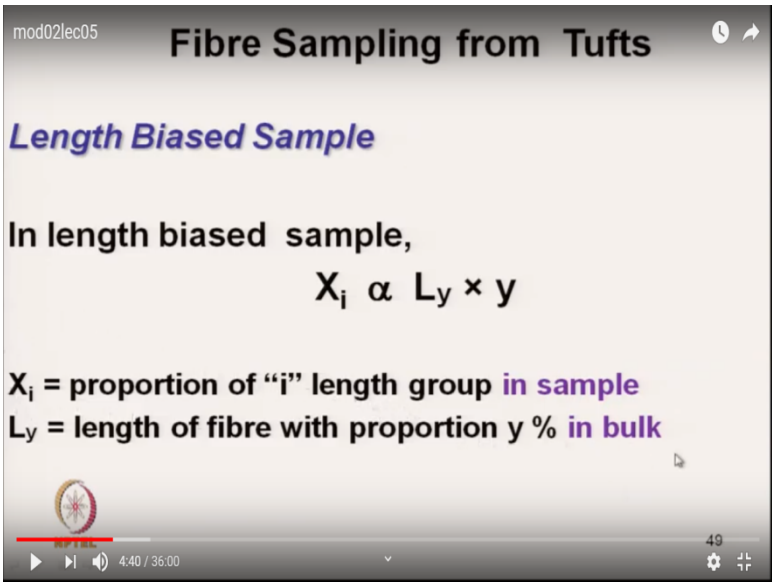

And also we have discussed this is the Xi is proportional to the Ly multiplied by Y where Xi is equal to the proportion of i length group sample and Ly is equal to length of the fibre with proportion of Y % in bulk. So Xi talking about the sample and Y is talking about the bulk.

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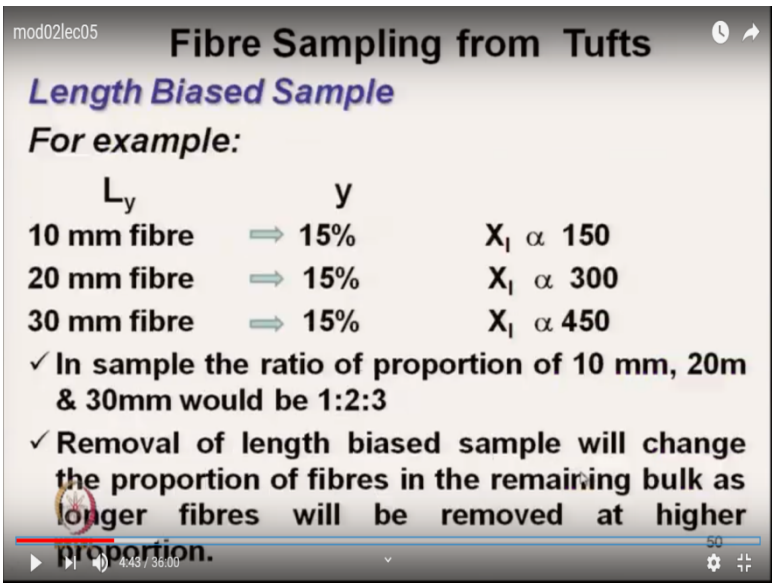

Now the example we can see here. Suppose there are three different types of fibres are mixed, along with other fibres. Say, let us take the example of 10 millimetre fibre is 15%, 20 millimetre fibre it's a 15%, 30 millimetre fibre there, its 15%. They are equally distributed. So proportion is equal. Their ratio is 1:1:1, along with the other fibres, okay. Now when it is a length biased sample, then it will be Xi is proportional to 10 multiplied by 15 that is 150.

Here in this case, in 20 millimetre its case is 20 multiplied by 15, 300, 30 multiplied by 15, 450.

So if we see the proportion of 10 millimetre fibre, 20 millimetre fibre and 30 millimetre their fibre proportion will be 1:2:3.That means in bulk, this fibres proportions were 1:1:1. There are equal proportions but when we take the sample, then their proportion changes, depending on the length of the fibre. That means in the, the sample the longer fibre has got higher chances of getting selected. So that is why the proportion has increased to 3.

As the length increases, the number of fibres in the bulk, in the sample will be more. So that means, if we remove this sample, some quantity of the sample, from the bulk, so that the remaining proportion of the bulk will get affected. So removal of length biased sample will change the proportion of fibres in the remaining bulk as the longer fibres will be removed at the higher proportion. That it will always keep on changing the proportion. So that is length biased sample.

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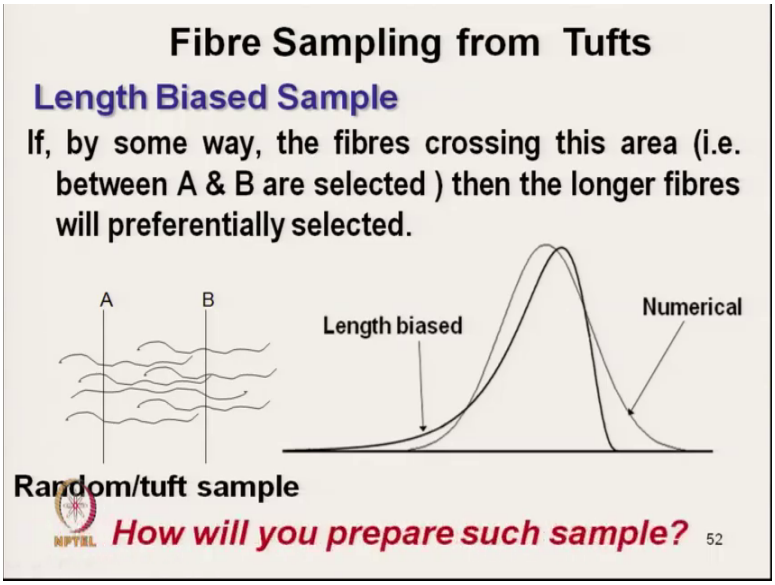

Now how to get this length biased sample? The chances of fibres, crossing the line AB line, this line, it is actually that longer fibre will cross the probability of crossing this line will be more. So that is why, if by some way, the fibres crossing this area, that means AB area, if we can select, then the longer fibres will preferably be selected. So, here, if we see the line this is the numerical sampling, where the samples or its almost there is no variation in length. It reflects the bulk. But when we take the length biased sample that is longer length will be selected. This distribution has been skewed.

Earlier if we assumed the bulk is normal distribution, then the sample would be normal distribution in case of numerical sampling. But here in case of length biased sample it will be skewed towards higher length. So then, how to prepare this sample? Length biased sample.

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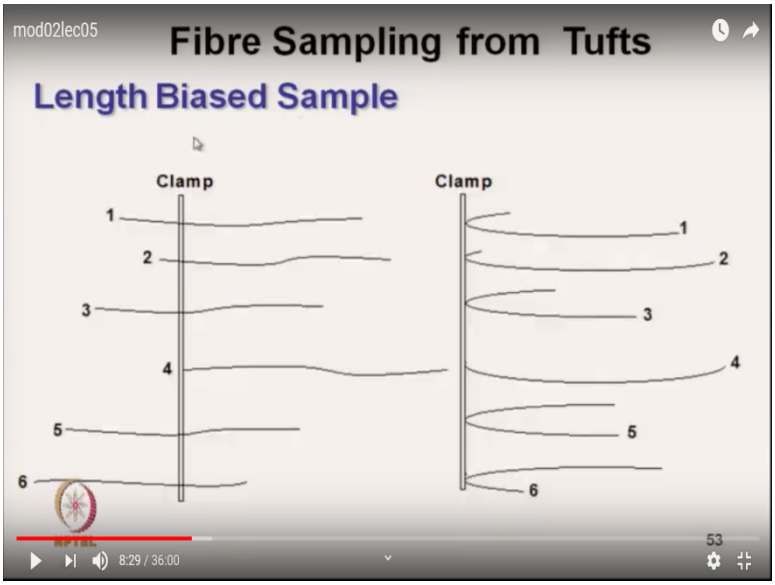

So this is the way, we prepared and the most common example is the fibro sampler, in case of high volume instrument. So this is the clamp, where this clamp from the surface of the fibre, bulk. If we see this is the fibre bulk and if we try to pick the fibre from the surface, so that this sample is length biased sample because the probability of longer fibre is always more to get selected. So, that is why this is the length biased sample.

And here, after clamping this fibres will get folded like fibre 1, forms like this, fibre 2, forms like this, fibre 3, fibre 4 has been clamped at the end point. Now, there are some two assumptions main assumptions are there.

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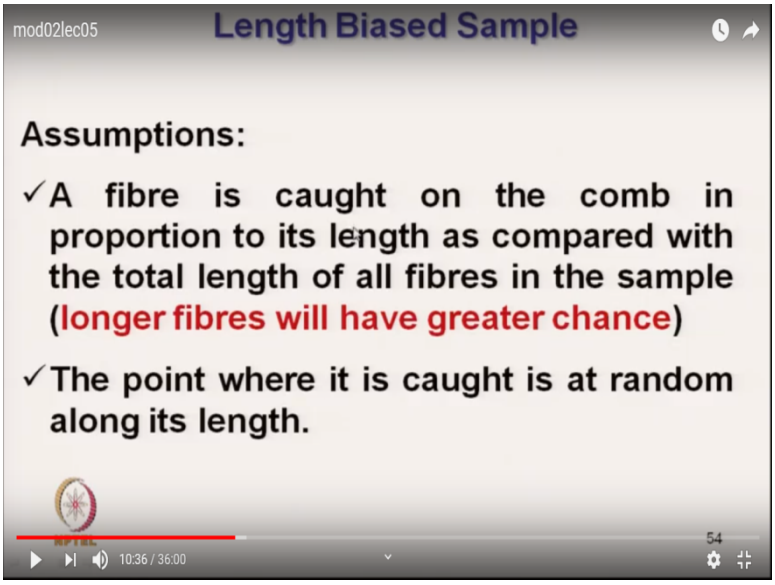

What are these assumptions? The assumptions are a fibre is caught on the comb in the proportion to its length, as compared to the total length of the all the fibres in the sample. That means longer fibre will have greater chances, okay. That is the first assumption. And second assumption is that, the point where it is caught is at random along its length. So that means, if we assume it is a one cut polyester fibre.

So if we for the sake of our experiment experimentation, so if we see this, actually this fibres, this process is used for cotton or fibres with variable length. Now if we try to see this assumption okay. Now our assumption is that we, these are the two assumptions. Now let us see if we take the fibres of same fibre length okay. And this is the fibres,

These are the fibres. It has been assumed that, it has same length all the fibres are of same length. Now the first assumption is not valid here. Because all the fibres they have the same probability of getting selected. Now the second assumption is that, they will be picked from different points at random. Now this fibre here it is fibre one, if we see carefully, it is a selected at point which is little bit one side is longer and another side shorter.

Fibre two, one side is very long and another side is very short. It is almost at the edge. Third one is, almost at the centre, but right side little bit longer, okay. Fourth one it has been picked at the end point. Fifth one is almost at the centre. Sixth one, right side it is shorter and this one left side is smaller. So in this way, if we see all the fibres, they are they will be selected at certain point. Now after, that if this things are folded, the ends of folded.

Then if we will see these fibres are arranged in such a fashion, the density of the fibres from the, comb the clamp side. If we go right side, the density will follow a straight line curve. So that things we will discuss. So this is density of fibre from the length verses the, this proportion of the fibre it is called the fibrograph. That we will discuss later .So these are the assumptions we have discussed.

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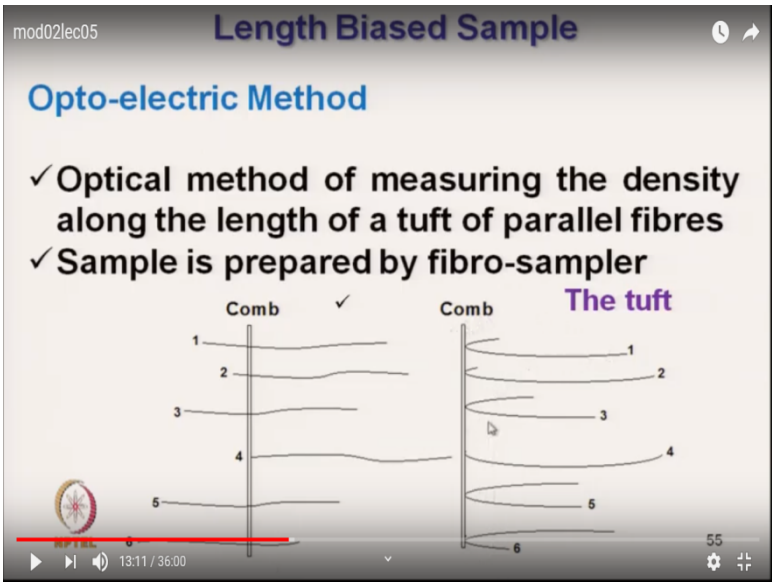

Now in opto electric method, this optical method is that, a method of measuring the density along the length of a tuft parallel, for the parallel fibres okay. The sample is prepared by fibro-sampler, as we have mentioned earlier .This is called tuft and this is the tuft that we have seen earlier. This is the clamped fibre and finally this is the tuft. And in opto electric method, the density of fibres present is measured optically, okay.

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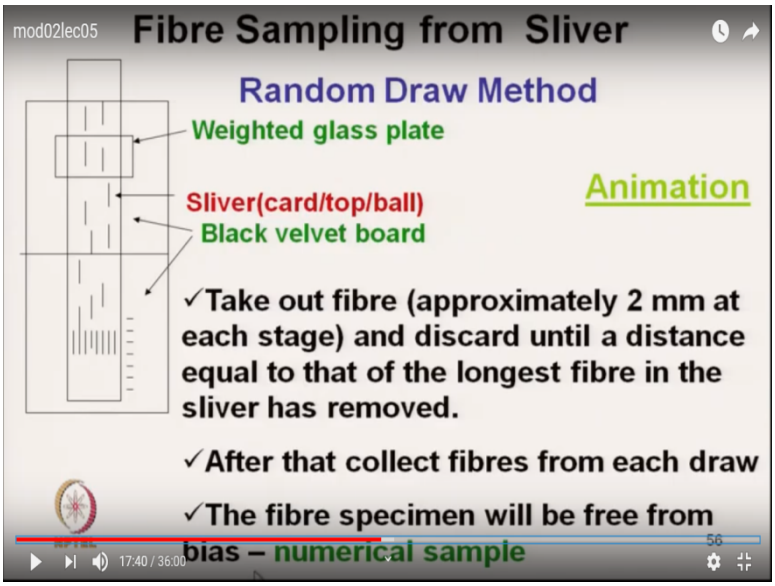

So that we will discuss here, now next sample is that it is a random draw method. The random draw method is used to sample loose fibre from the continuous strand of parallel fibres. This strands maybe a sliver. Also we can use this method by in case of roving .But roving main problem is that roving it has got twist. For roving, there are other methods. But random draw method principly it is used particularly for sliver. Here this is sliver, okay. And it is a black helmet board is there, okay.

So, take out the fibres approximately 2 millimetre at each stage. So first this is the black velvet board, above that the sliver is placed, okay, test sliver. And we are pasting some weighted glass so that the sliver does not move. Now then, what we have to do? We have to take out some fibre end, from the end. So this is, supposed it is placed on the black velvet band. We have to take approximately 2 millimetre of fibre at each stage.

So at each stage, we will keep on taking out fibre from ,say, we will grip at ,say 2 millimetre fibre. So in that way and the distance until, the distance equal to the longest fibre in the sliver has removed. So we have to take out the fibres, till the longest fibres, is removed, in this way and at the stage of, 2 millimetre. So why are we doing this things, just to avoid any eliminate, any chance of being selected, selection of any broken fibre, undue broken fibre.

So from the edge till the longest fibre is removed we are discarding all these fibres. After that next, it is assume that it is a natural length of fibre. From there we will keep on removing the fibre and keeping it, for testing .So this is called random draw method after that collect the fibres from each draw. So every removal it is called one draw. And then we will keep the fibre. And these fibres will be used for different testing, like length, diameter, anything, okay.

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Now, let us see the animation here. Now, these fibres are being green colour it is showing, these are removed. So fist we are removing the fibre till the natural length has got. Now, after that we are taking the fibre. So every draw we are doing and removing and keeping for testing. And glass this plate that is where, it is removed, moved upward gradually. So, now these draws are actually used for the, these of the test specimen. This is used for testing okay. This method is known as the random draw method okay.

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Now the fibre specimen will be free from by biasness. Here, there is actually, it is totally length biasness is not there because when we are removing the fibres, from the tip. So there is even the smaller fibre or longer fibre short fibre and long fibre. They will have equal opportunity to get selected, okay. That is called, this is called numerical sampling.

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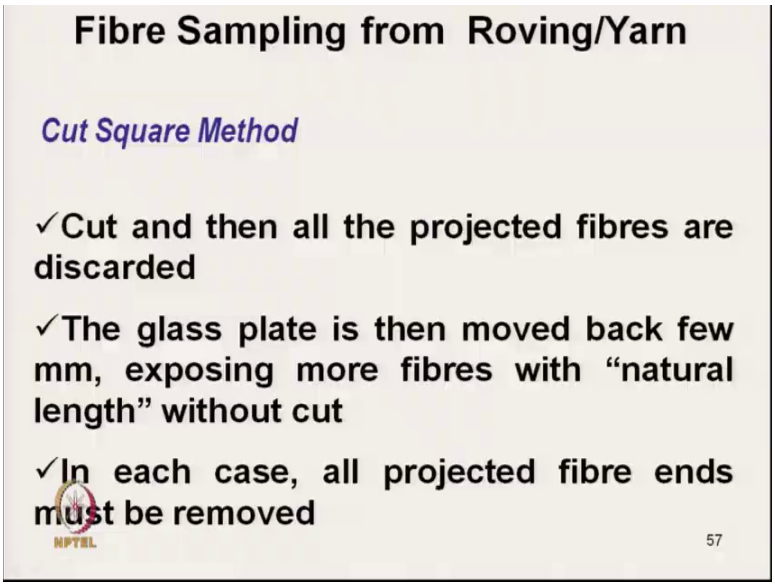

Similar technique is used for another method for roving or yarn. Even we can use for sliver also. This technique is known as the cut square technique. So as the name suggest, it is because we have to cut this. So cut the end of the strand and then all projected fibres are discarded okay. So suppose this is the yarn. So we have to take the sample from the yarn okay. First we have to cut, we are cutting it, okay.

Then we have to take the, take out these fibres, okay now during cutting or breaking, so it sure that there are some breakage in fibre. So, this fibre's the, natural length is not there. Some broken lengths are there, okay. Now to remove this broken length, first we have to remove these fibres. And also it is not like sliver, where there is no twist. Here in yarn and roving twists are present.

So in that case, what we have to do, we have to untwist the roving and yarn. So that fibres come out. So fist what we have to do? We untwist the roving or yarn. So untwist this then the fibres are becoming parallel. And after that we take out fibres. In the same way, we keep on removing the fibre and discarding. We do not want to keep return those fibres initially, till the natural length is present.

Because when we are cutting, that means we are our, there are chances that fibres ends are cut. So after removal of all these fibres then we will try to, then, whatever fibres will remove, will keep those fibres. So, the glass plate is then moved back few millimetres, exposing more fibres with natural length, without cut. Initially there are fibres with cut those has been actually those has been discarded.

In each case all projected fibre ends must be removed. So whatever projected fibres, because that what it is some fibres are projected. Then all the fibres, we have to remove. Then after that, the plate the glass plate has to be moved little bit backward few millimetre. Then gradually all the fibres we have to remove. Now, this is the way.

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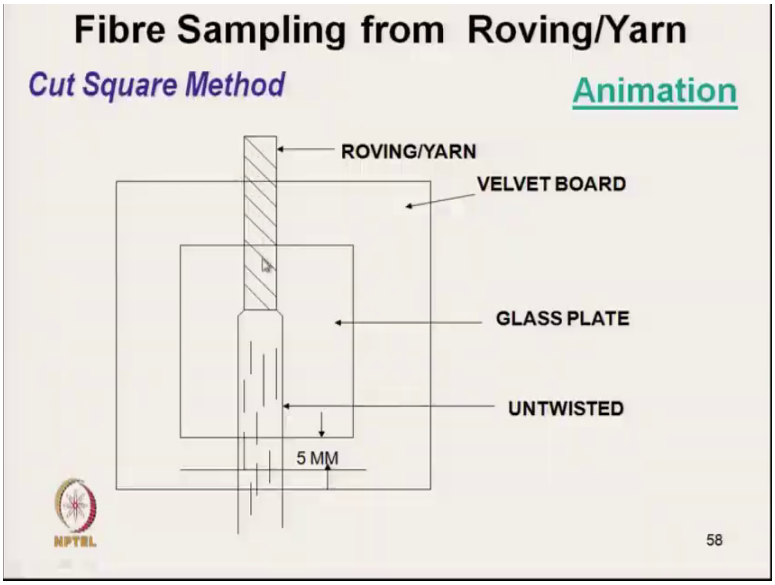

So, first this is the roving or yarn. And this is glass plate. Glass plate is kept just to keep the fibres intact the roving intact, so that we can take out the fibres from the endpoint. And then in roving or yarn we have to do one extra operation. We have to untwist the end. So, that the fibres become parallel. And this then we have to take out the fibres, okay. Now let us see the animation here.

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This is the sample keeping board, okay. On this board, we have to keep the actual sample. Now this is the cut end. What we are doing? We are rotating the cut end that means we are untwisting the end. So now it is being rotated. Now the fibres become parallel. And after that

we are first operation is that we will remove the fibres with cut length, okay. So this fibre will be discarded. Now it has been discarded, okay.

The fibres, after that after removal of few fibres few steps, now it has become this is the natural length. Then we are taking the draw .This is the first sample of natural length of fibre. Then next sample we will do. This is the second draw. In that way, we will keep on doing, till the required number of fibres is collected, okay. This is, this system is known as cut square technique, okay. Now this is the cut draw, third draw okay. So, in this way we will keep on taking the sample.

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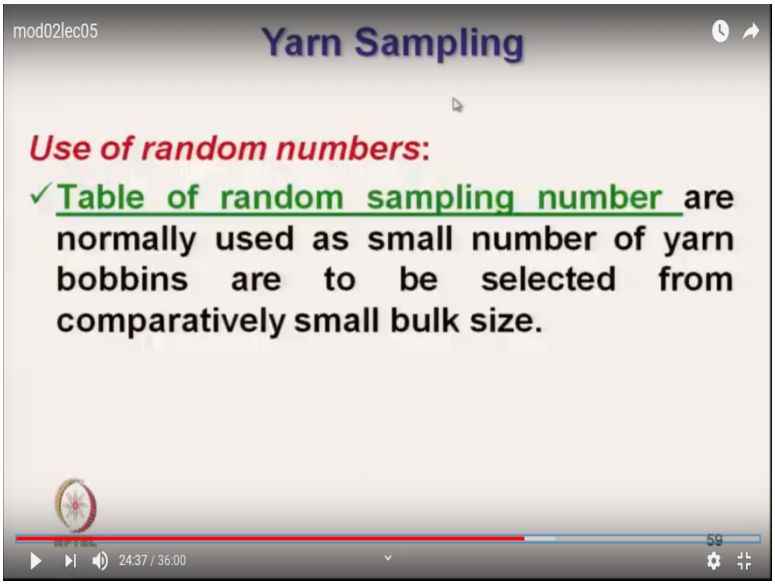

Now we will see the till now what we have seen the sampling of loose fibres, sampling of loose fibre from bale, sampling of loose fibre from sliver, sampling of loose fibre from yarn or roving. And next is the yarn sampling. So yarn sampling is typically what we do? We use random numbering. Use random number and table of random number sampling is used. As small number of, bobbins are to be selected from comparatively large bulk of sample. So random sampling is used here which we have discussed earlier.

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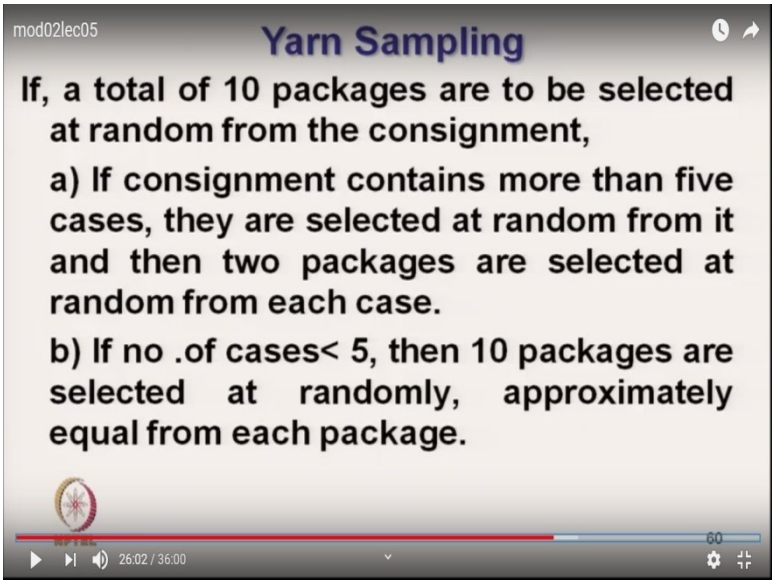

Suppose for example if a total of 10 packages are to be selected. Suppose we want to select ten packages at random from a consignment. So, from the consignment of few tons so we want to select 10 bobbins, okay, 10 combs, if the consignment consists more than 5 cases, 5 packets, they are selected at random from it. And then two packages are selected at random from each case. So 5 cases we can select, if it suppose a 1000 case. So, then depending on the, we will select the 5 cases from that randomly sampling and from the cases you will again select two bobbins two combs per case randomly, okay.

In case, there are less than 5 cases what we do we take 10 packages randomly, approximately equal from each package like that we have to see.

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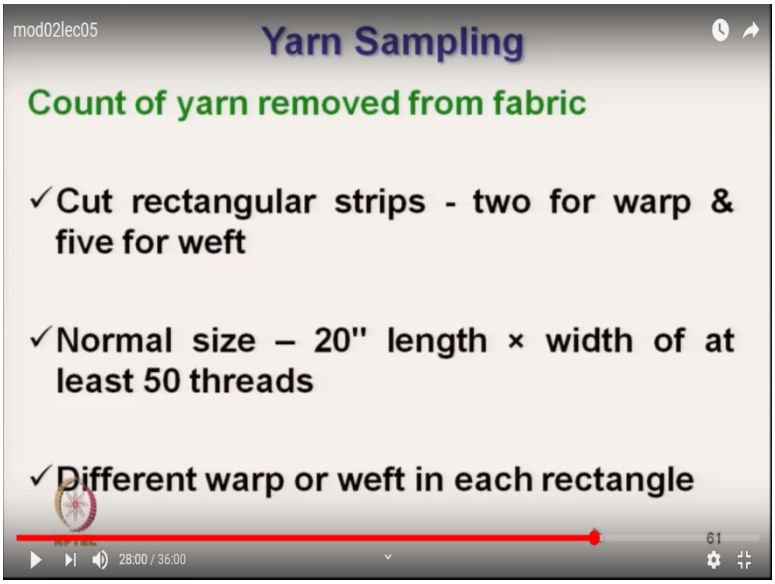

Now for Count of yarn removed from fabric. Suppose we want to measure the count of yarn and which is removed from the fabric. So what we do? This is for measurement of yarn count okay. So we have to cut the rectangular strip from the fabric. So what we do? Two strips we cut from the warps direction and typically as per standard 5 for weft standard, weft side. While for warp, less because warp it is controlled.

During warping we select, we actually we know which lot is used. For warp we normally used from the same lot. But weft it is coming from different sources or it may be different lots, okay. That is why number of samples should be more in case of weft. What is the size? Normal size is 20 inch length for measuring the count of yarn. So length is 20 inch and width, it varies at least from the width size we should have 50 threads.

Because from the fabric, we should be able to take out minimum 50 threads that is the width of the fabric, okay. And length should be around 20 inch. And different warp or weft, in each rectangle, that is important. Now let us see,

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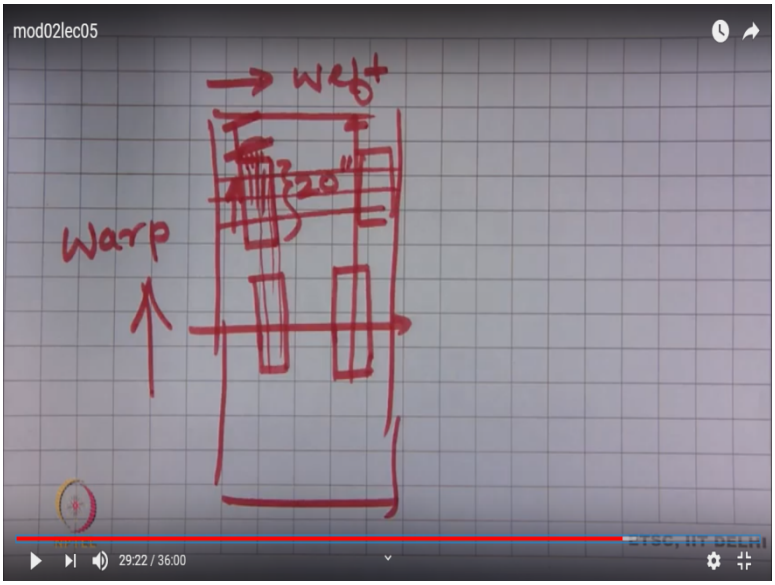

Suppose this is a fabric. This is fabric, this is warp. This one is weft direction okay. Now what the way we have to select? This is for warp direction length, we want to select okay. And there will be say, minimum width will be such that at least 50 shades are there, in this way we have to cut. And this is the length its 20 inch. This is one specimen. Next specimen we cannot take from the size.

Here because they will have common warp. We cannot take. Similarly we cannot take from this portion. Because there will be common weft. So what we have to do? We have to take the sample. This is say, specimen one. Second specimen we have to take from this portion. Because there is no common warp or there is no common weft. So that is how we have to select the warp and weft. So that different warp and weft combination should be there okay.

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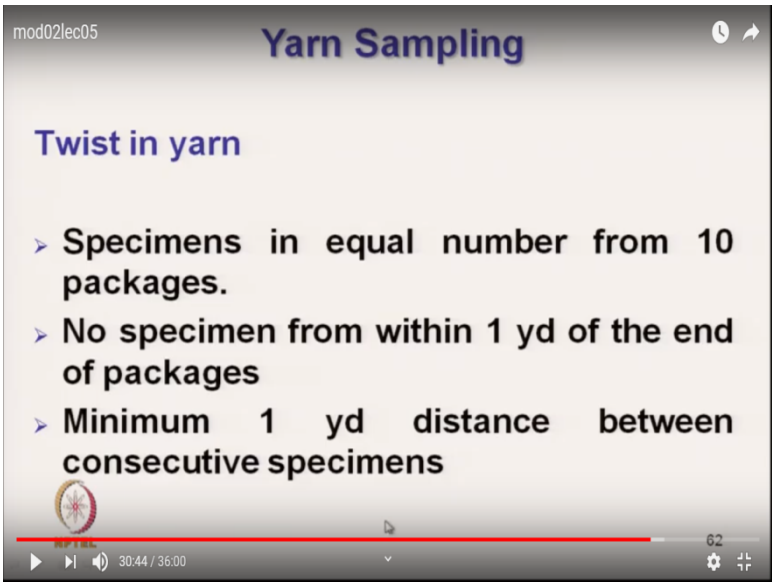

Now to measure twist in yarn we have to follow little bit different process. Specimen in equal number from 10 packages we have to take. So, this is to save one package. So if we want to test say twist 50 readings we want to take, because of that statistical sample we have to take. So if we want to take say 10 from 10 packages so 50 readings, so from each packages we have to take 5 readings okay.

At least 10 packages we have to take. Number of specimen from within 1 yard of end of the packages so no specimen we have to take. We have to take out we have to discard at least 1 metre 1 yard of length. So no specimen we have to we can take from within the one yard of the length. So one yard typically we have to discard. Minimum one yard distance between one consecutive specimen.

So if we take after removal, if we take a twist measure twist from this portion. Then we have to remove at least one yard. Then we can take. Otherwise what will happen, twists normally try to get untwisted. Any material twisted material wills always natural tendency is to get untwisted from the endpoint. So just to avoid, eliminate this type of possibility, we have to

take all these precautions. While because twist measurement is that if the twist is getting untwisted then we will get wrong result.

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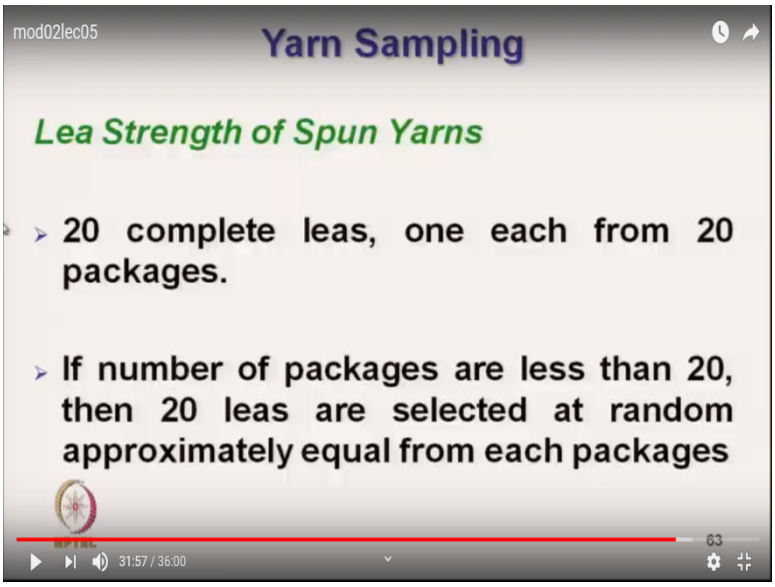

Now for lea strength of spun yarn 20 complete leas we have to take okay, one each from 20 packages. So, minimum 20 leas we have to take. And we should take one lea from each package. Because why is it? It is only one lea from each package, because lea takes care of a longer length. It is totally typically, it is a 120 yards, okay. That is why from one package, only lea is enough. If the numbers of packages are less than 20, then 20 leas are selected at random approximately equal from each package. Suppose we have say, 10 packages. So in that case from each package, we can take, in that case only we can take 2 leas per package. So ultimately we have to take so 20 leas.

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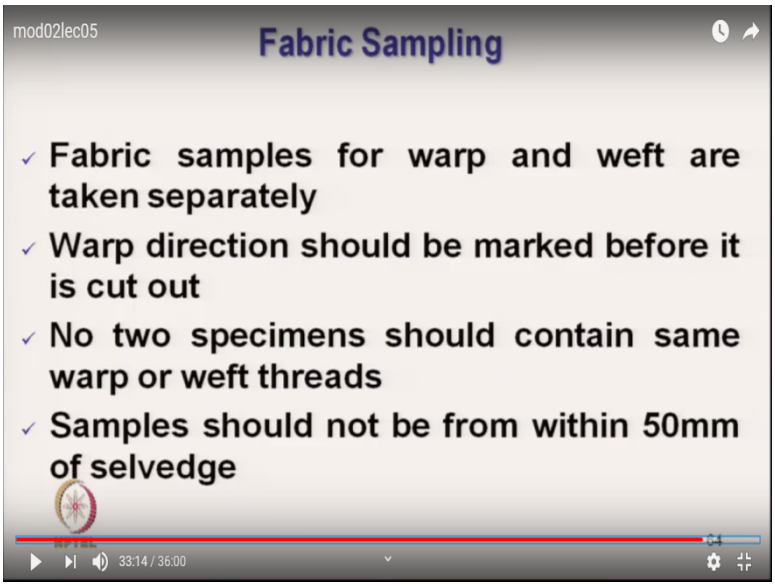

Now coming to last segment how to sample fabric? So fabric samples for warp and weft are taken separately. First what we have to do? Warp direction should be marked .We should know that after cutting. It is very difficult to identify which direction is warp and which one is weft. So, before cutting, we should mark the direction which is warp and which one is weft. So, similarly like we have discussed no two specimens should contain same warp or same weft, okay weft threads.

Samples should not be from within from the edge. Because at the age we will have some salvage some other problem may be there. So we should try to avoid at least 5 cm from the sample. We should collect the sample. So 50 millimetre from the sample, we have to take silvage.

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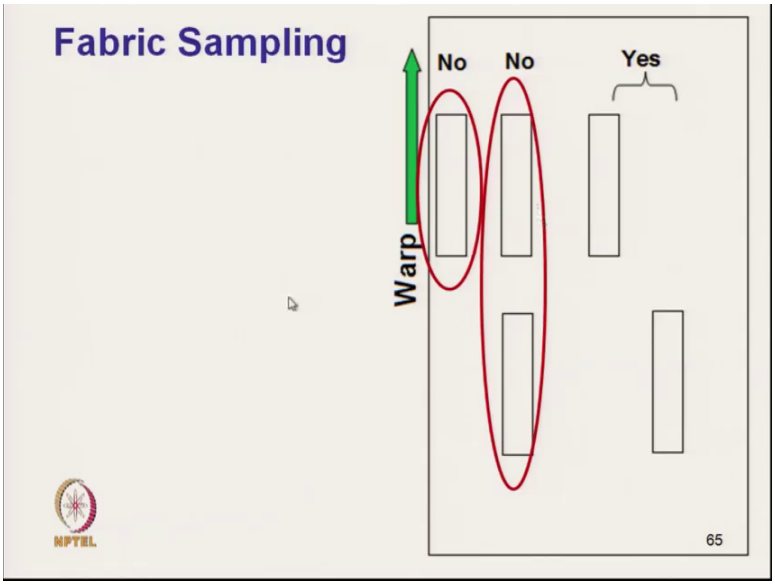

Now these are the different cuttings. So, this is one sample, okay.Now, if we, if I want to take this sample is it correct? So this is not correct. This is no, why? Because this sample is at the edge of the fabric it is a very close to the silvage. So this is not acceptable, okay. Now these two samples, these are not acceptable. Because we are taking the warp sample so these are these two samples they have the same warp. So this is again not acceptable, okay.

And what about this to these are correct sampling. Because they are they contain different sets of warp and different sets of wefts. So this is yes. Also if we want to take only warp, so this two are will warp. This two will warp. Because as far as only warp are concern, okay. Similarly for weft; for weft, if we see this sample, this is the weft direction. So sample one it is not correct, because this is at the edge of the fabric.

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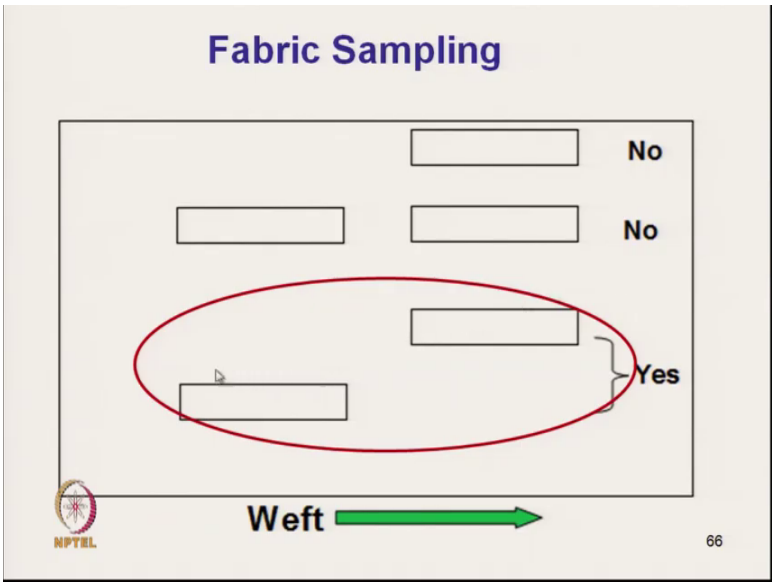

This is also not correct, same weft. And this is correct. Because they are, they contain different threads of wefts. Now I think that is all about the sampling from textile material in different forms, like fibre form, yarn form, sliver, roving and from fabric. So, then after sampling, we have to actually perform the testing, okay. Now, thank you.