Evaluation of Textile Materials
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Lecture No -17
Evaluation of Linear Density of Textile Materials (contd.,)

Hello everyone, so, we will continue with the topic measurement of yarn linear density. In last class we have discussed various linear density expression systems like tex, English count, metric count, also. We have also seen the relationship between the one counting system to the other system also we are discussed the count system how to get the resultant count. So, the resultants count for direct system and indirect system.

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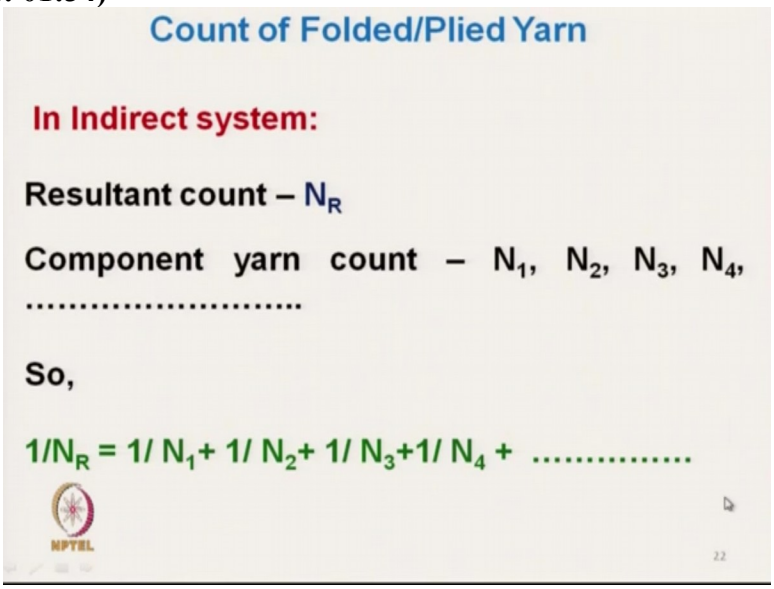

Here, if we see in indirect system the resultant count are calculated based on the reciprocal of the individually yarn counted. These are the system we have discussed.

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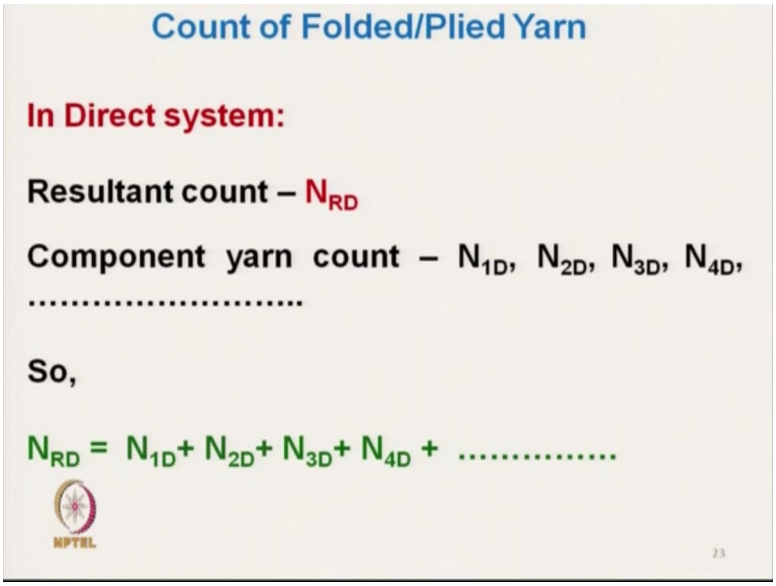

And for direct system, the resultant counts are calculated by simply adding the component yarns count.

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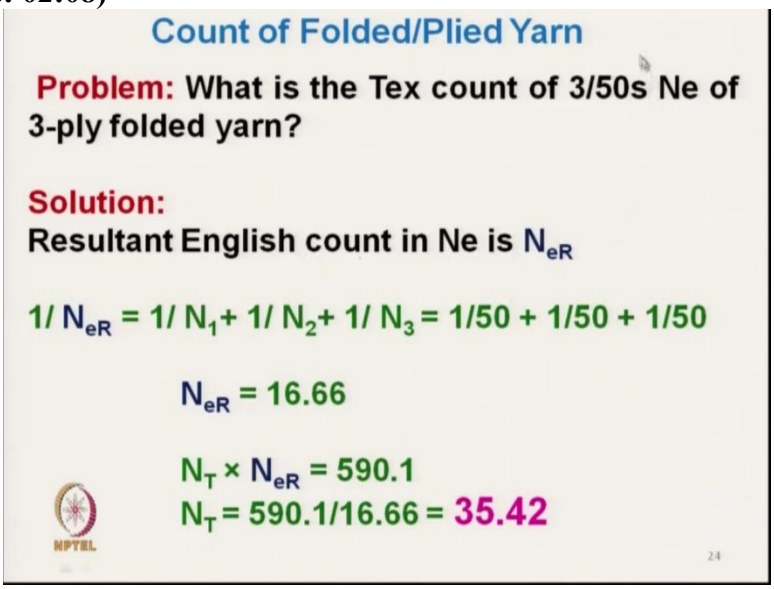

And also we have discussed different problem, practical problem and how to calculate the resultant counts. So, here we have seen say 3 ply of yarn of same English count, how to count into 3 ply folded yarn count in the Tex system. So, if we ply 3 50s Ne count and ultimately we have seen the resultant count will be 35.42.

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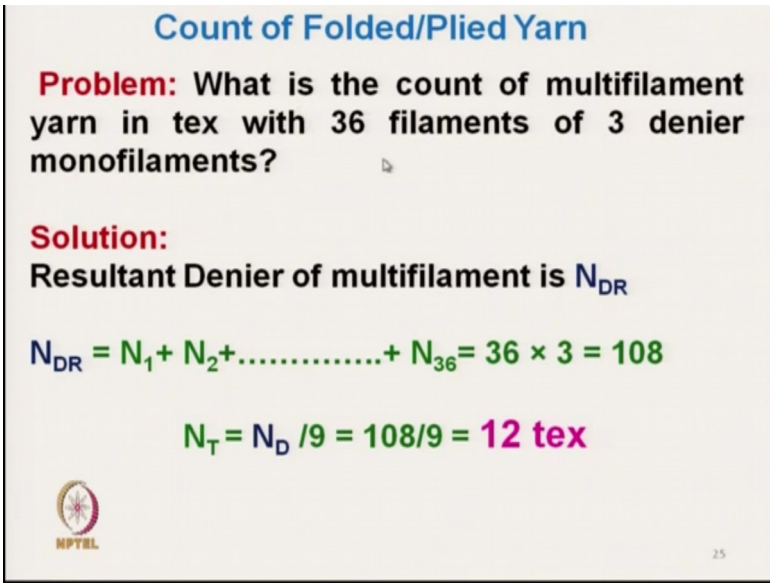

Similarly, we have seen in direct system suppose 36 filaments were there of 3 denier each mono filament and we have seen the Tex count was 12 tex ok.

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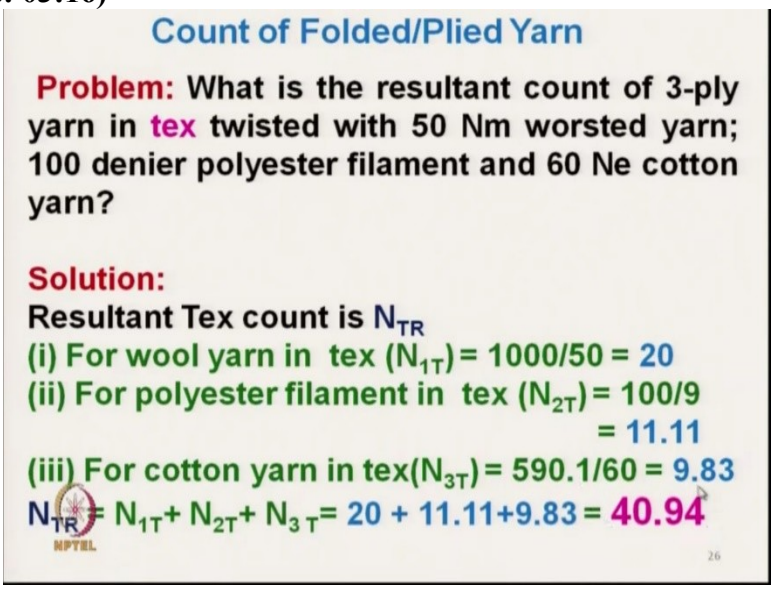

In another problem which was unpractically practical in the industry we face this type of problem types where say 3 ply yarn of different types of yarn expressed in different system. So, in conventional we have seen the worsted yarn is expressed in terms Ne metric count in the industry itself. And polyester filament is expressed in denier and cotton yarn is expressed in Ne or NT. Here it is Ne here the idea was if you want to calculate the resultant count.

First thing was that, we have to convert the individual count to a single counting system. And best idea is to convert into direct system. As direct system tex was there and we required in terms of tex so we have converted all these counts into tex system ok. So, 20 sometimes 50 Ne an yarn

metric count yarn became 20 tex and 100 denier yarn will became11.11 tex and 60 Ne an yarn became 9.83 tex then simply added and this was a resultant count that is 40.94 tex.

Now we will start how to measure we will discuss different ways of measurement, different method measurements of the linear yarn density.

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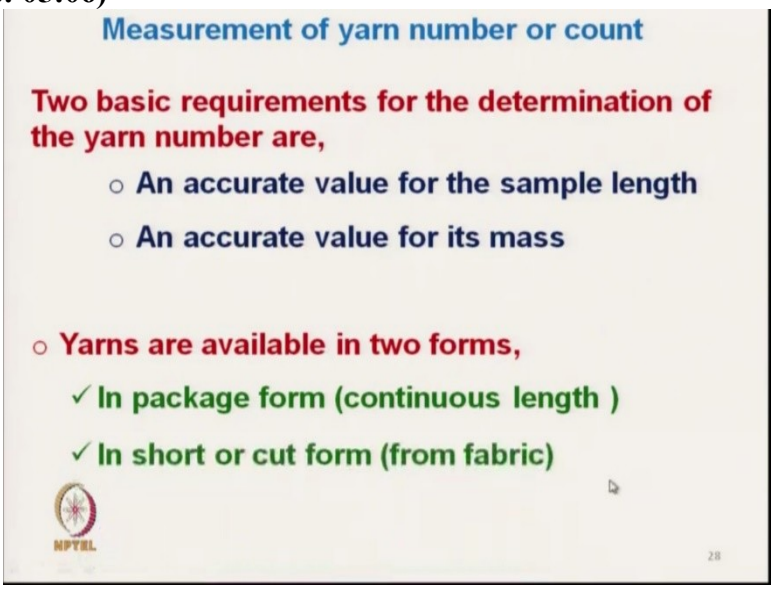

So, to measure the linear density, there are two basic requirements for determining the yarn count. So, why do we need to know the yarn count, it is that an accurate value of the sample length. So, if we have known the mass we have seen earlier, if we have known the mass, so we need to know the actual sample length actual length of the lea that was actually require for many applications.

And, an accurate value of its mass where accurate length of the mass of its mass ok, this is the actual length of the particular mass of the yarn. So, if we know the length of the yarn what is the actual mass of this yarn ok the yarns are available so far measuring count the yarns are available in two forms ,one is continuous form another one is cut form small length. So, in package form where the longer lengths are available, so suppose in bobbin form, where we have longer length, okay and in cone or cheese form longer continuous lengths are available.

But in that case, we can measure the count using in by measuring technique but there are other situations where we do not have the package. We have small cut length and we would like to know measure the yarn count, okay. In short or cut form suppose we have piece of fabric and we need to measure the yarn count ok. So, there are various system, so we will discuss one by one.

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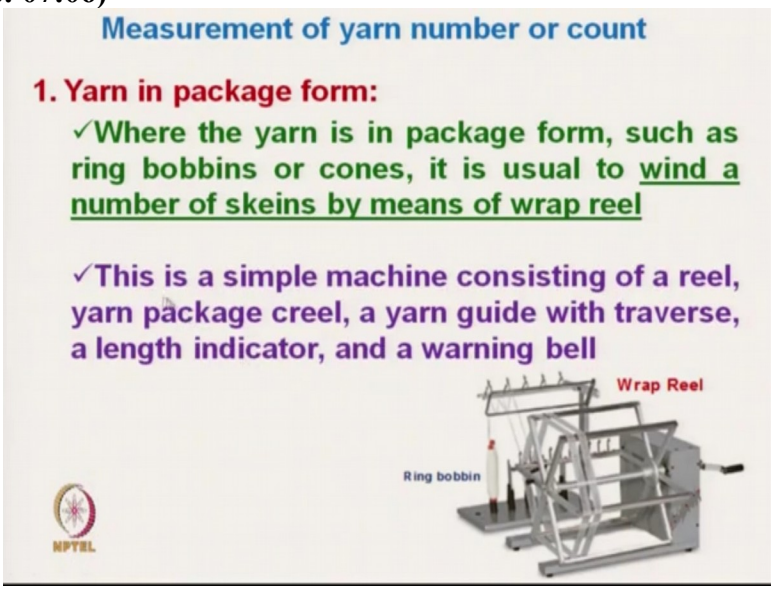

So, yarn in package form, we have longer length of yarn available. When the yarn is in the package form such as ring bobbin or cone it is usual to wind, a number of skeins of by means of wrap reel, number of hangs and number of leas continually of certain length by using the wrap reel. If you want to measure the count so this wrap reel. This wrap reel it is a simple machine which consists of reel, there is a reel, a yarn passage, this is yarn package it is a bobbin, ring bobbin is there, yarn package and package creel is there. Package creel will be there that this instruments has got this is the reel on which we wrap the yarn, the creel where we place the package maybe in the form of cone or in the form of bobbin, ring bobbin.

A yarn guide system and this is the yarn guide system and this guide has got little traverse, it moves sideways little bit. Gradually, it moves so that the idea here is that the yarn while wrapping that, the length of the every wrap, should be almost same if there is no traverse the problem would be that the thickness of the particular place will keep on increasing because yarn will be wrapped over the earlier layer, so in that way a layer will increase, so we will not get the actual length of the yarn.

Our idea is to get actual length of the yarn, so in that case when traverse not there, we will get the totally different length higher length we will get. A length indicator is there now, here length indicator does not actually measure the length of yarn which is being unbounded. It measured by the number of rotational of this wrap reel. So, if the wrap reel it has got fixed circumference, the

circumference of the wrap reel is say 1.5 yard ok, so lea of say 120 yard requires say 80 such turns ok.

After say 80 turns there will be one indicator, so warning bell will be there and that immediately, this we have to stop the winding or in automatic machine it will automatically get stop. So, after say 80 yard, 80 turns, 120 yard if the yarn is known, 80 turns will be required. Now if we do not have the traverse, then the problem would be that after 80 turn will not have 120 yard it will be little bit more than 120 yard.

And when will take the mass of that yarn then will get wrong result ok. So, that is why we take care that proper traversing is there or not, is there any jamming in traversal system or not that we have to take care and also, the traversing, another advantage of traversing is that we have to; while taking out the lea from the wrap reel if it is the yarns are wrapped one over the other, it is thick lea thickness of the wrap is more. In that case taking out the lea will be difficult.

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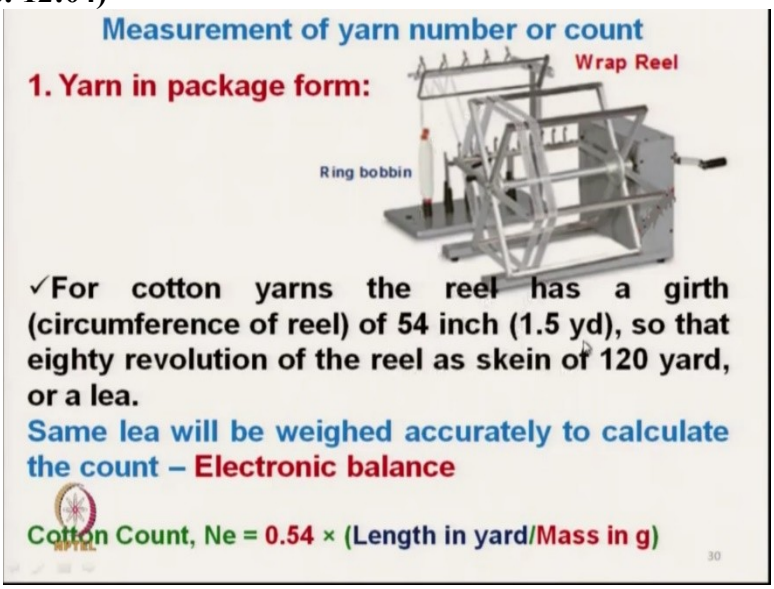

Now for cotton yarn, the reel has a girth of circumference this reel as circumference of 54 inch 1.5 yd ok. So, that 80 revolution of the reel will as skein of 120 yard, so 120 yard is normally termed as lea ok. So, 80 turns is there so we have got 120 yard. Now the same lea will have, we can just take the mass of that lea. So the mass of the lea will get by electronic balance and simply we can calculate the count system and using the earlier formula, if we know the length of the yarn 120 yard.

And if we take the mass, 0.54 multiplied by length in yard 120 and divided by mass in grams. So, the yarn counter counting measurement system, so, there are electronic balance is there direct count system. So, in that system in that particular instrument, the programming is there, program is in such a fashion that it is actually you have to feed the length unit how much yarn is there in the lea. See if you feed 120 yard and that you will use this simple formula and directly gives yarn count.

In English count or may be Tex count only thing you have make prepare a lea and just put keep on putting different lea it will give the mean count, individual yarn count, it can calculate the standard division, it can calculate the CV% and it is linked with a computer and we can simply take the reading ok, take the printout. So, this is not fully automatic, actually you have to take the lea and you have to put on the electronic balance ok and this wrap reel, it can be manual or it can be motor operated ok.

After having say 80 turns, automatically it will stop. So, this is the first system, that is using electronic balance, one can manually measure or this type of instruments are available.

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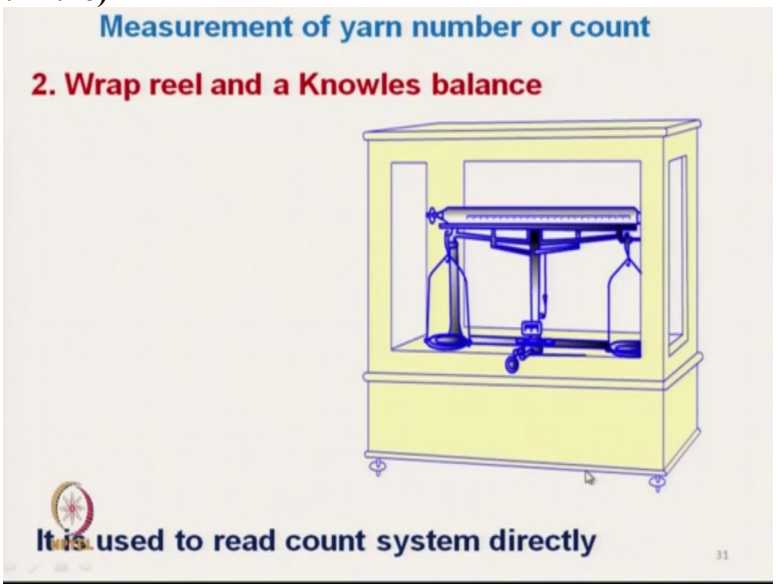

Second system, is where we use the wrap reel. Wrap reel is used to prepare the lea and a Knowles balances is there this the balance is the special balance it is called Knowles balance. Here we can directly read the counts system and once you; and now-a-days we do not use this in the industry because the automatically actually electronic system is available computer controlled system is available directly we can get count but, in early days, this Knowles balance was very helpful to get the direct yarn count system.

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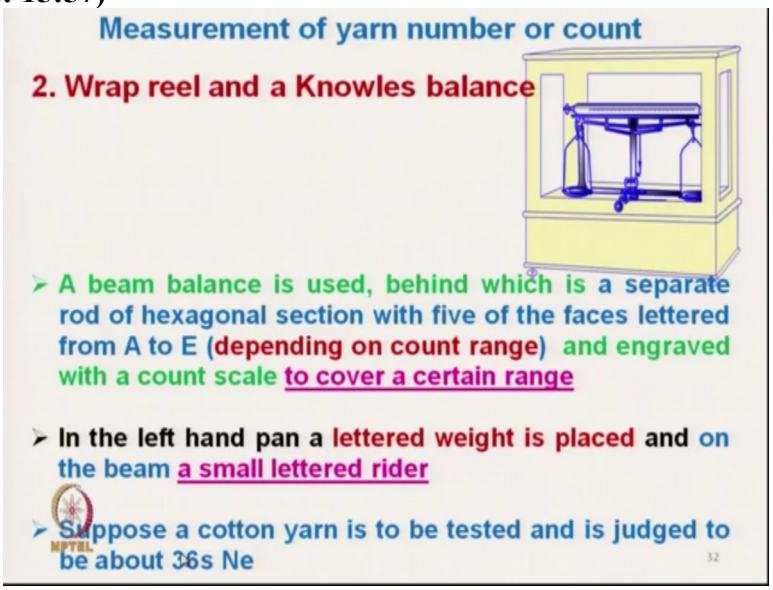

Now, here a beam balanced system is used, behind which this is the beam balance system normally balance system is there ok. And behind which is a separate rod of hexagonal section. So, one hexagonal section I can show you. This one is hexagonal section, in the hexagonal section is fixed where out of 6 sides of hexagonal sides 5 sides are actually indicated with different count range ok. So, out of 6, with the 5 of the faces lettered A to E. So, you can rotate 5 faces so, A, B, C, D, E, 5 faces, depending on the count range.

Suppose A, section count range in coarser section may be particularly say 1 to 5 so different count systems are there, only cotton system different count range are there. So, A being coarse side, B is little bit finer range in this way E is the finest count range. In that way a different range and it is gauged it is actually marked a different count and engraved with a count scale to cover a certain range. So, certain range is covered, in the left hand pan here, okay, a lettered weight. So there are different mass, weights are there. So, 5 such weights will be available. A, B, C, D, E ok.

When we will and if we know the typical count, suppose we know a yarn it is around the range of 50's so, we will place that particular side, will rotate that side and place that; rotate that hexagonal rod and place particular side. Suppose it is a C for that particular count range we know the nominal count range ok that count range we are placing, that side and say C side, corresponding to that side C weight we have to place here. In left hand pan ok left hand pan lettered weight is placed and on the beam again small lettered rider will be there.

There will be different rider for a different letter ok. For A there will be A rider, for B there will be B rider, like that. Suppose a cotton yarn is to be tested and its nominal count its expected count is 36 count. In that case, for 36 count range, it comes out to be B, face B of the scale is turned to the front, weight B is placed on the left-handed pan, and rider B is put on the beam. So, on the beam we have to put the rider. So here there will be rider, we have to put on the beam, and the rider has to be shifted, just to be balance ok.

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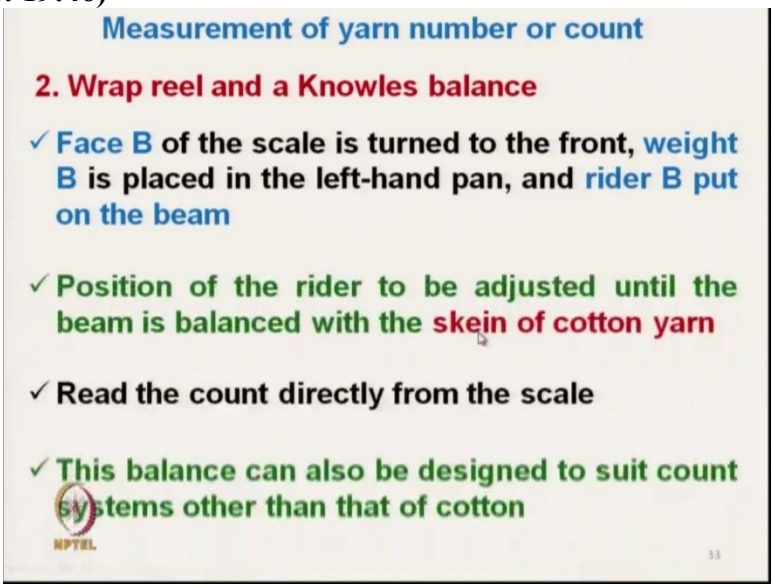

So the rider B put on the beam. Now, the position of the rider to be adjusted until the beam is balanced with the skein of cotton yarn. The cotton yarn is put on the right side there will be little bit of unbalance, if there is unbalance we have to shift the riders either left or right side, so to balance the yarn count. And then we can read the yarn count directly from the scale. Here it is that range we expect suppose the yarn it is not coming to that range.

So, then we will have shift if it is coarse or finer we will come know whether it is coarser or finer, in the accordingly we will shift to other faces will change the weight we will change the rider and in that way we will continue. This balance can also be designed to suit count systems other than that of cotton. So, one can always change the count system. Depending on the count system, one can change the mass or weight or rider or the skeins. It is the best idea, just to change the scale, one can directly get it.

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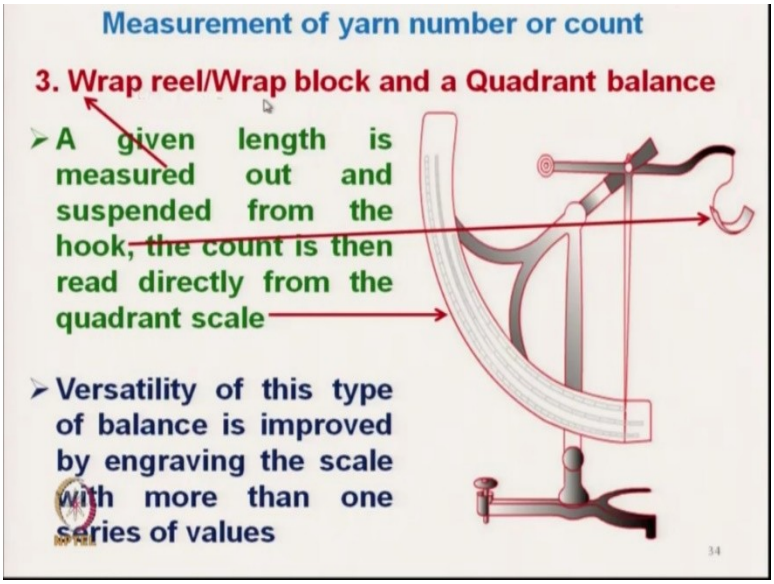

The other system is quadrant balance, quadrant balance again we can get directly the count system this was used earlier now again it is not been used. Earlier the problem was that, we have to take the length and we have to calculate that is why the system were evolved just know them quickly know the count system. So, the quadrant balance here is that. A given length is measured here typically 120 yard for yarn and for sliver there is specific length for roving there is specific length. In this system we can measure for yarn, for Sliver or for roving, specific length are there ok. So, for yarn suppose in yarn 120 yard are given length is measured out by using the wrap reel either you can use wrap reel or wrap block we use for sliver and roving.

So, if it is yarn use wrap reel then after measuring the specified length, then it is suspended from the hook this is the hook, this is the yarn with specific reel is measured using wrap reel or a block ok. Then it is suspended from the hook this is the hook we are suspending from the hook and specific mass is to balance here is available here it is there. And it works on a beam balancing system. And the count is then, directly from the quadrant scale this is the quadrant scale. So, once we put the yarn here, this actually this needle will get deflected ok.

For the same length of yarn if the length say it is a finer yarn if it is suppose here the deflected here. If it is coarser yarn that means it will get deflected here that means a counting system starts from this is showing finer yarn then gradually becoming coarser yarn. Here the idea is that keep the length exactly fixed ok. So, it is simply by balancing system. It is a versatile system ok. And

this is actually we can do for yarn for sliver and roving and also if we can change a scale; that scale that we can just change in cotton system or tex system and any other system we can do it.

But in Tex system, in direct system if you want to do, it will be on the reverse direction. In cotton system in that way we can always change the scaling. So, versatility of this system can be balance is improved by engraving the scale with more than one series of values. So what we can do, here one thing is that we can change the versatility by scaling for yarn, sliver, roving and also can add keep on adding different scales for different count systems for tex and metric count we can do.

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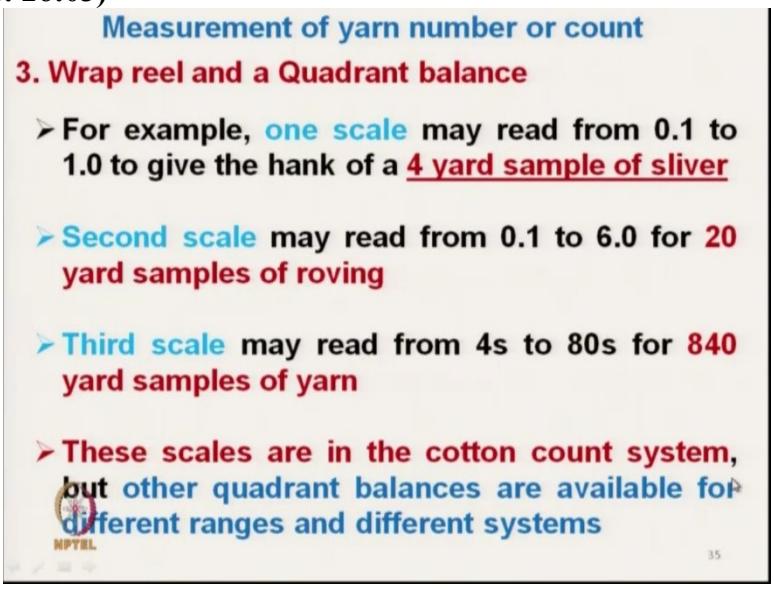

For example, one scale may read from 0.1 to 1, so we have 3 scales, one scale for .1 to 1 to give the hank of 4 yard of sample of sliver. So, this is just for example ok, if we know the range of the sliver, it is assumed that sliver count is 0.1 to 1 hank 1 Ne. In that case and for sliver we will normally take it is a 4 yard for sample for yarn we will take 840 yards ok. And for second scale this is the first scale, second scale is for roving and it is gauged from 0.1 to 6 that is the range of the count, range of the hank of roving 0.1 to 6 and here the standard length is 20 yards of length.

Sample length 20 yards of roving and third one is for yarn say 4 count to 80s count and here 840 yards of sample. So, this 840 yard and it we will give directly yarn count. These scales are in the cotton count system ok. In quadrant balance it is normally, in cotton count systems are available but other quadrant balances are available for different ranges and different systems. So for different system if we need to get quadrant balance directly for tex we can always get ok.

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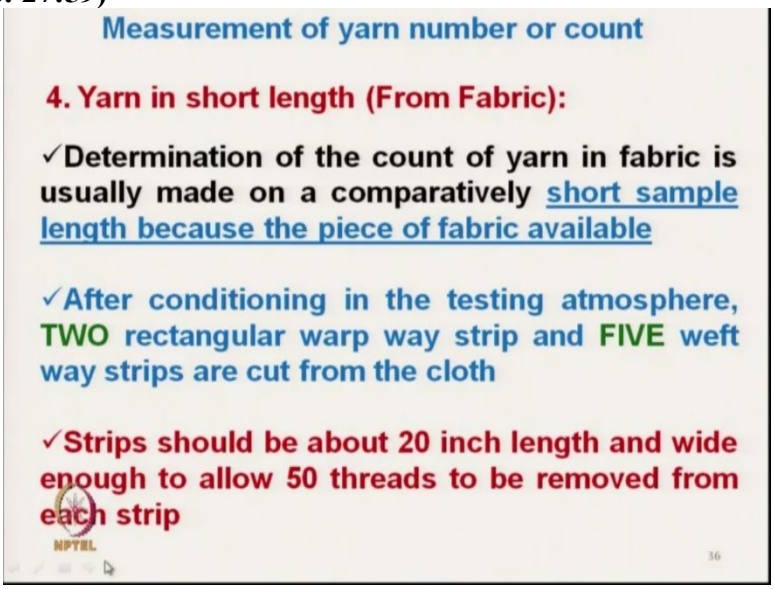

Now the yarn count for short length suppose we have fabric we can get the yarn count. For that certain precaution we can take determination of the count of yarn in fabric is usually made one comparatively short length okay because always it is piece of fabric are available most of the cases. And also it is not possible to take the longer length from the fabric. We cannot take 120 yards simply. So, after conditioning in the testing atmospheric say 24 hours typically 2 rectangular wrap way strip and 5 weft way strips are cut from the cloth.

So, why 2 only for warp because the warp actually during warping we will work from individually cone. That individual state represents one different separate cone in that case, two weft way strips will be enough to represent the number of threads, number of different cones enough threads. And 5 we require, we may even require more because majority of weft within that strip may be from single cone.

Because it is a weft, strip should be about 20 inch length and length of the strip should be around 20 inch and width is about so that it is allow 50 threads to be taken so that need to take around 50 threads so 20 inch length of 50 threads we should take.

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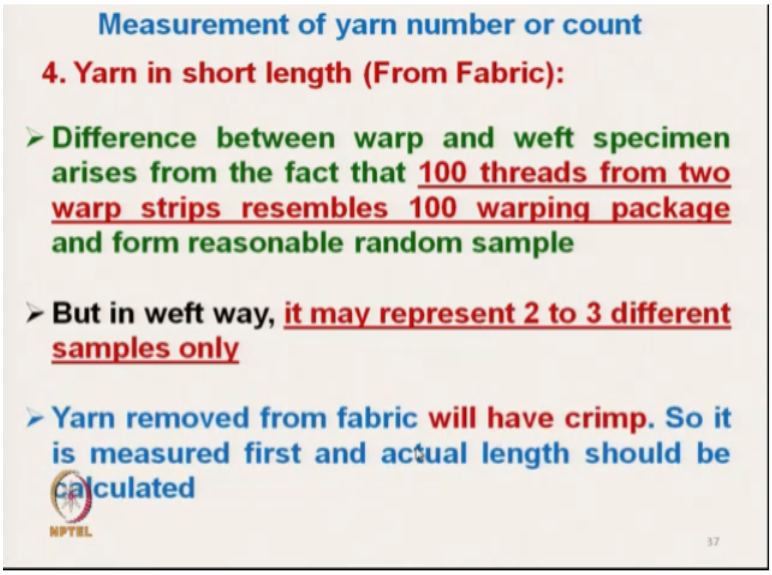

So the difference between wrap and weft specimen arises from the fact as I have discussed, that 100 threads from 2 warp strips ok that means 100; 1 wrap strips we are get 50 threads, so from 2 we are getting 100 threads. That is equivalent to 100 warping package ok 100 different warping packages and from reasonable randomness, we are getting that means if we take 2 strips that equivalent to the yarns from 100 package with randomness, that is fairly random.

But in weft way, it may represent 2 to 3 different samples that is why we need wide range of larger numbers of samples. So, 100 versus 2 that mean you have sample is very narrow ok. Yarn removed from the fabric and then it may contain crimp. So, that means we are not going to get actual length of the yarn. So, before, further proceed, we must measure crimp average crimp we have to measure and suppose has we seen it is a 20 inch length.

So, actual length of fabric, actual length of yarn will be little bit more that yarn length we have to get actually a length by calculating the or by measuring crimp and this correction by multiplying the correction factor we can get the length of the individual thread and then we can calculate the actual length. And here in this system we can use the micro balance electronic balance and we take the mass, measure the mass and we can calculate the count of the yarn.

So, for both warp and weft because in weft normally the weft direction crimp is high so in that case we have to; we must use the correction factor. And this is the direct it is not the automatic system it is not direct system we have to calculate the count of the yarn. So the yarns are then weighed accurately to calculate the count.

So, in this system, we have to use electronic balance ok. And here after that we have to manually calculate because we cannot program. In that case we have to have program, we have to feed the length so it is easy to calculate manually ok. So 100 threads are there so, 100 threads we know and we take the; and we calculate the total length and we can take the mass ok.

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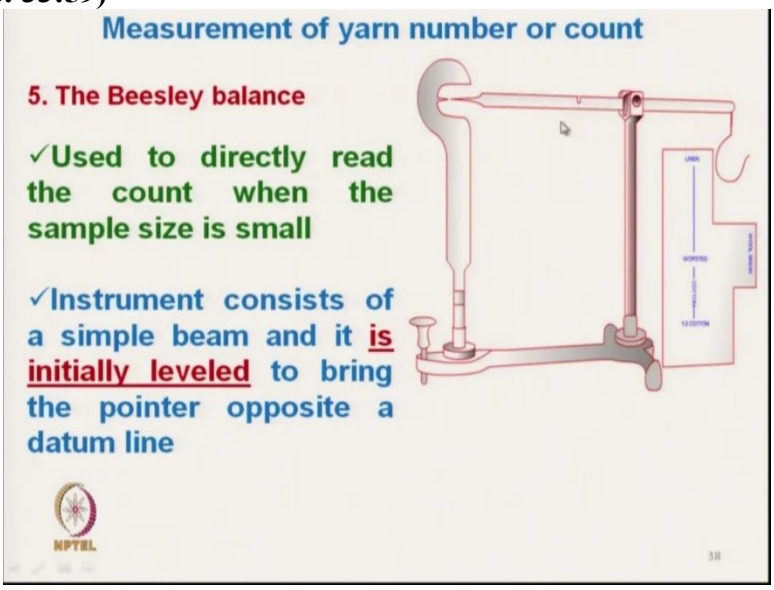

The last process is the Beesley balance, this balance here using small cut length we can measure the system yarn count directly. And also in this method, we can get the count or number of yarn or yarn linear density in different measuring system. It is used to directly read the count when the samples size is small. So, we can directly get the count of yarn ok. Instrument consists of a simple beam it is a simple beam and it is again works on beam balance principle and initially leveled. So, without any material or without anything it should be leveled.

Okay, and when it is leveled this pointer actually brings the pointer opposite to the datum line, this is the datum line, and this is the initial line ok that shows that the instrument is balanced. So, without any material if the instrument is not balanced that means there is something wrong either with leveling or with some that is there in pivot section, here this is the pivot section there is some jamming. So, this beam should be freely moving ok. This should be balanced. If it is not balance then this is the screw, balanced system we can level it ok.

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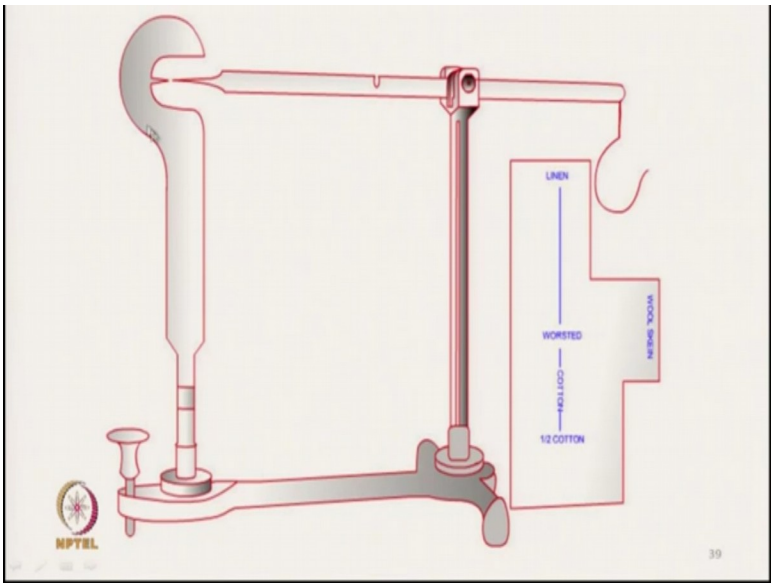

Now this is larger view where is the balance and datum line is there and another this is separate one templates will be given this template shows that you have to cut the fabric of that length, so small piece of fabric, so this length this longer length this we can use for say cotton or linen ok this linen ok. This one we can be used for worsted or cotton. This is for cotton or linen system. so different; so this is for half- cotton system.

Okay, so for different count, if we want to get the yarn number of a particular count system. We have to use this template ok. And then according to the size of the template we have to cut the fabric ok. We must mark the length and cut fabric. After cutting the fabric then we have to carefully take out the threads.

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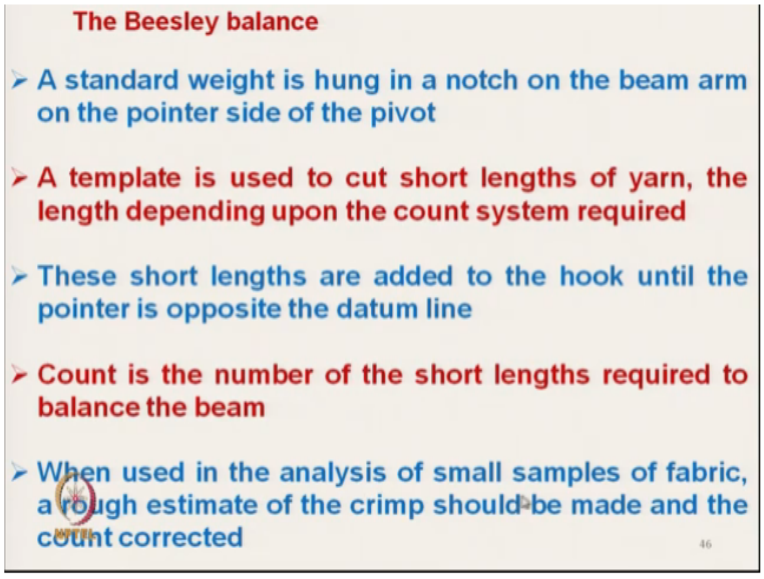

Another thing here is that one standard weight will be there and which is; which we have to actually hang in the notch of the beam on the pointer side on the pivot. So, there are two sides, so this is side of sample side and left side is the pointer side there is a notch is there and where a standard mass is there clip type that we have to simply put on that and that standard mass we have to and that depends on your count system so different count system we can have different mass. And when we are putting this mass this without any material suppose for cotton system we have cut the sample and we have put the mass here this pointer will lowered because this side it has been heavier ok.

And then a template is used to cut short lengths of yarn and we have to cut the fibre, fabric of short length. The length depending upon the count system ok for different count system we have different lengths. So, this is for different count system and we have different length then these short lengths are added one by one ok to the hook and until the pointer is opposite side just exactly to the datum line.

So, initially when there was no material we have put the weight it has lowered down. So, after putting one it is not balanced to two, three we are gradually we are going to put the small length, till it is balanced ok. So for say cotton count if you are gradually balancing then we can get the count system directly it is the count. The count is the number of the short lengths required to balance the beam.

So, that means this is the count we are getting directly, when used in the analysis of small samples of fabric, a rough estimate of the crimp has to be there so we must know the crimp value again then only we will be able to get the actual length ok and then we can correct it. So, this correction is important and then we can get directly the yarn count system. So, here in this segment, in this topic what we have discussed, we have discussed different count measurement system.

And this count measurement systems are we can have the yarn in different forms the continuous form, large package form where we have enough yarn we can make lea normally in count system we can take the lea of 120 yards and in also we have discussed for if we have smaller lengths of yarns available okay this may be in the form of fabric or in the form of small cut yarn sample. In that case suppose we do not have yarn sample 120 yards available we have to smaller length is available, in that case we can use these systems of short length yarn counting system.

So knowing this yarn count we can calculate the total length or total mass of yarn required so, here now this is all about the yarn linear density measurement. And in the next segment we will discuss other topic; we will start with tensile testing of textile material. Till then, thank you.