Evaluation of Textile Materials
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Lecture-37
Evaluation of Bursting & Tear Strength of Fabrics

Hello everyone, today we will start a topic which is very important for get this do we use ok or some special applications.

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This characteristics are very important and these are bursting characteristic of fabric and tear characteristics, tear strength of fabrics. So, this 2 characteristics they are important not only for apparel type textile but for industrial textiles or technical textiles particularly bursting is extremely important for apparel fabrics bursting is not that important. But when we geo-textile, filter fabric, parachute cloth bursting strength is very important.

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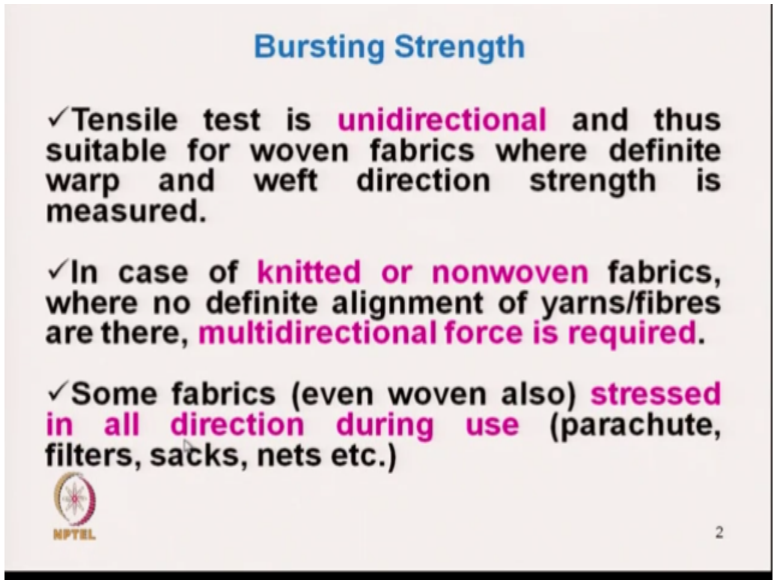

So, we will start with bursting strength of textile material, so when we talk about the tensile testing as we have seen earlier. Tensile testing deals with unidirectional characteristics thus it is suitable for fabrics like woven fabric where definite warp and weft direction is actually there ok.

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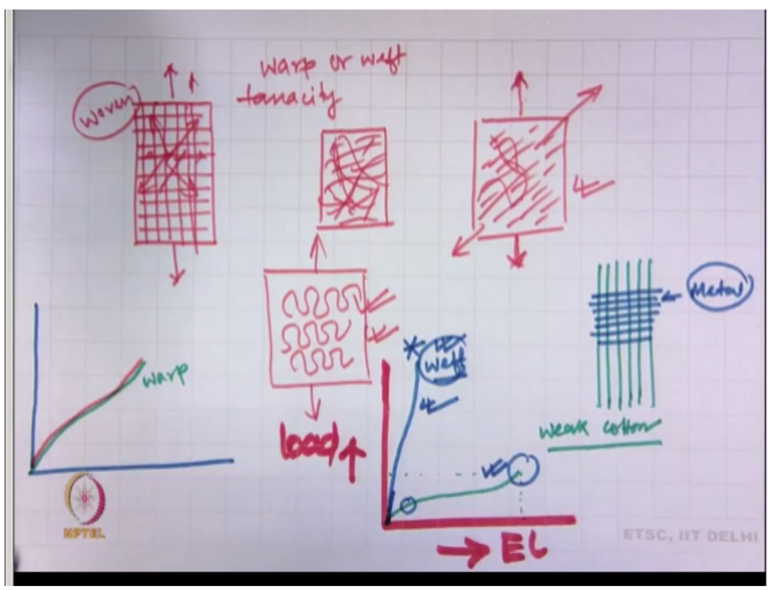

So, now in tensile as we have seen the maybe strip testing or graph testing we take strength in one of the directions either it is warp direction or in weft direction. So, then we can express that tenacity is warp tenacity or weft tenacity. And up to this it is ok now when we talk about the tenacity of non-woven fabric coir the fibres are aligned at random direction, so actually we do not know then which direction fibres are aligned.

So, when we try to test non-woven fabric of a where fibre say most of the fibres are aligned in at certain angle even as a user when we try to measure the strength suppose in length wise direction we are trying to measure. So, we will actually lined up with strength which is much lower than the actual strength in this direction. So, it is actually it may give some wrong result, so this wrong result sometime leads to wrong decision making.

Similarly in case knitted fabric there is no definite direction where the yarns are aligned, so in that way it is very difficult to express the strength in terms of tenacity in a particular direction for this non-woven fabric and the knitted fabric. Apart from non-woven and knitted fabric for some special applications like as I have mentioned the parachute cloth or geo-textiles or filter fabric where woven fabrics are used we require to know the strength not only in 1 direction.

But in multi direction, multiple direction strength is required, so in all these cases the tenacity in particular direction is not going to help us. So, we must know some characteristics which will give us idea about the strength in multi-direction when we stress in multi-direction. So, in that case bursting strength helps to get some idea, so in case of knitted or non-woven fabrics where no definite alignment of yarns fibres are there.

So, multidirectional force is required and some fabrics as I have mentioned like parachute fabric, filter cloth, sacks, nets when this fabrics are in use the fabrics are stressed in all the direction. So, we need to test the bursting strength.

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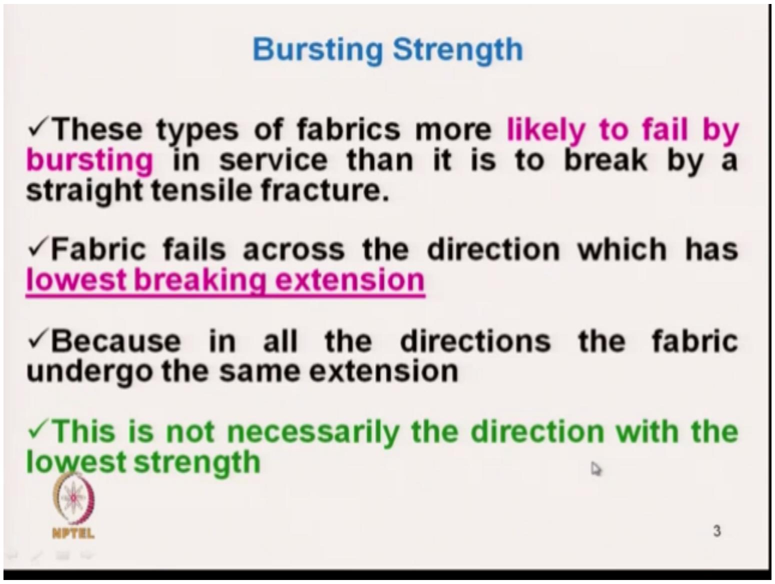

So, this type of fabrics like parachute, filter fabric, geo textiles is more likely to fail by bursting in service when we use this fabric they likely to fail in bursting than it is break by the straight tensile fracture. So, in this case, so if we take the tensile test result than we may land up with the wrong impression about the fabric. Fabric fails across the direction where lowest breaking extension is there that is the very important.

Now suppose we have a fabric which is having a metallic ware, so this suppose warp is say it is a cotton with weak cotton ok. It is not strength is not very high it is strength is very week and in the weft direction what we have inserted we have inserted metallic ware says steel ware this is the metal very high strength metallic ware. So, what will happen, so if we draw the stress strength curve or load elongation curve elongation load elongation curve of say weak cotton.

This is the cotton with certain extensibility but the breaking load is low whereas the metal say stainless steel or high carbon steel or say carbon fibre it is strength. So, this is suppose a carbon fibre it is a very high strength this is the carbon fibre. Now weft, so what will happen when will we test the fabric for bursting strength the direction where the extensibility is less, so this weft direction here the total load will be shared by majority of the load will be shared by the weft.

And first and the cotton will share least weight because cottons load breaking load it will not actually it will not share at that time and majority on all the load will be on the weft. So, the total use of the utilization of the loads tensile characteristics will not be there if the extensibility extension characteristics of both warp and weft are different. So, on the other hand if we use some week the relatively weaker yarn.

But their breaking extension are same like we can draw again, so in warp what we have seen this is relatively weaker moderate yarn but in warp this is in warp. And another yarn in weft we are using the weft if we test the tensile characteristics of weft is almost same. So, what will happen during vesting when warp and weft they are getting extended both warp and weft will actually share the load.

So, ultimately we will get the higher bursting strength similarly if we have fabric from same yarn, suppose we are producing fabric from the some same yarn.

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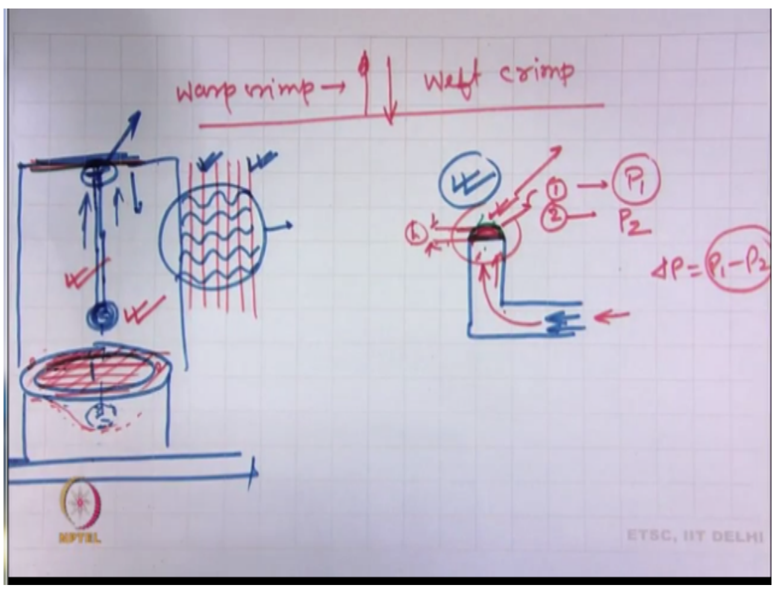

But the crimp say warp crimp is much lower sorry much lower than weft crimp, so warp crimp is lower. So, warps are straight, suppose this is it is a warp there is no such crimp but in weft if we see weft yarns are say crimpy here. And this fabric if we actually test if we test for bursting the problem will be that the fabric the direction with lesser crimp will share load maximum load will be shared by that direction warp direction.

But weft during initial stretching it will get straighten and it will not share the load initially, so first the warp threads will break then immediately the load will be transfer to the weft and then it will break it will burst. So, bursting means even a single direction yarn breaks that mean the fabric totally fails, so we need the bursting actually simultaneously if warp breaks that means fabric is actually finished.

So we main reason is that here the warp and weft extensibility should be same breaking extension we have to maintain same. That is why for bursting strength for any fabric which we use for bursting strength or where bursting characteristics is important. In that case that we have to have fabric almost what is called it is balanced form where warp direction characteristics and weft direction characteristics are exactly almost same.

If there is some difference then will not be actually we will not be able to utilize the strength of both warp and weft direction. So, that is how we have to use a fabric which is actually uniform in all the direction, so fabric fails across the direction where which has lowest breaking extension ok. So, that is we have actually I have just explained because in all the directions the fabric undergo the same extension as it is bursting.

So, it will actually it is a extension will be same in all the direction, this is not necessarily the direction with the lowest strength ok. It is a lowest that I have just explained it is not necessary the direction which will break which will actually damage get damaged first it is not necessary the lowest strength it is the direction with lowest elongation breaking elongation.

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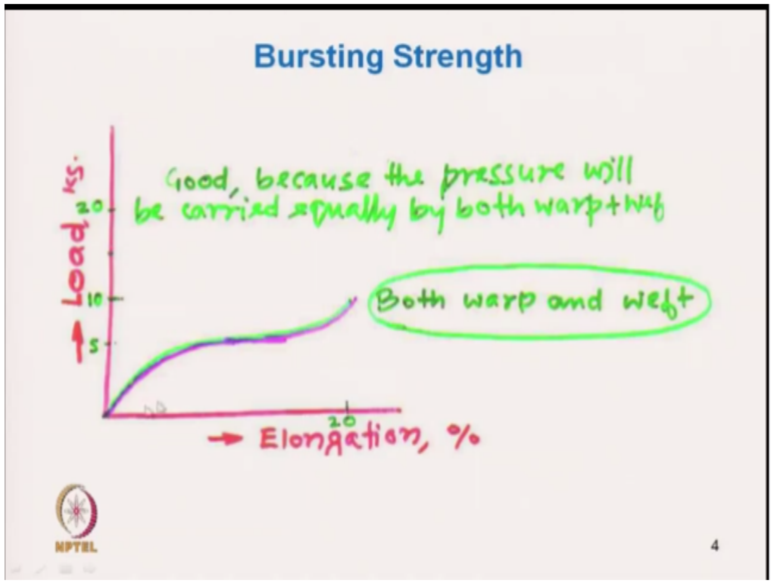

Now this curve at so both warp and weft they are exactly same, same that the crimp type of yarn has been arranged in such a fashion that they are extensively, load elongation curve is exactly same. So, because this is good because the pressure will be carried equally by the both warp and weft and they will actually same they will get added.

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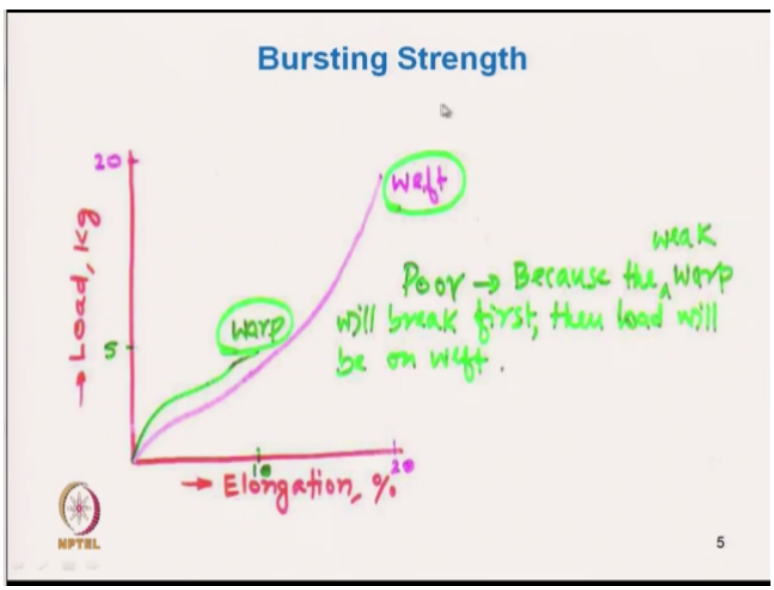

Now this one here the weft which is higher strength warp which is say weaker with the length this is poor. This type of fabric as per as bursting strength is concern this is poor performance it will give because the warp will be will break the which is weak warp will break first then total load will be transfer to the weft ok. So, that will be sequentially they will share load which will not result the higher bursting strength.

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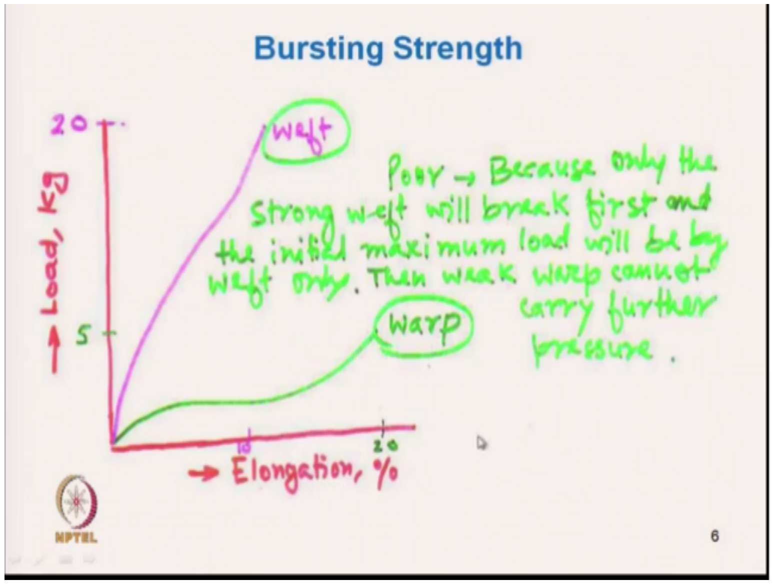

And similarly this one also poor that we have discussed because only the strong weft will break first. So, strong yarn we are breaking first and the total load will be then transfer to the weaker warp.

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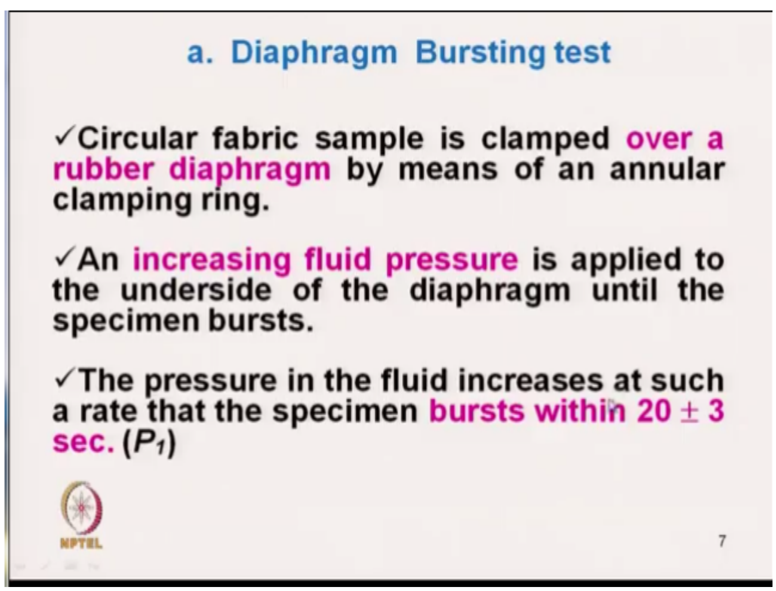

So, the testing methods are there are basically 2 different types of testing methods are there one is diaphragm type test is where a circular fabric sample is clamped over a rubber diaphragm by means of annular clamp ring. And increasing fluid pressure, so some fluid is a maybe a glycerin or some type of fluids are there. So, fluid pressure is applied to the inside basically inside the diaphragm until the specimen is burst.

So, and the pressure in the fluid increases as such as that the rate the bursting time is within 20 +/-3 second. So, we can increase the fluid pressure in such a fashion and knowing the extensibility of the fabric and bursting strength of the fabric. So, we can increase the fluid pressure at a certain rate ok, so that bursting takes place within +/-3 second, 20 +/-3 second.

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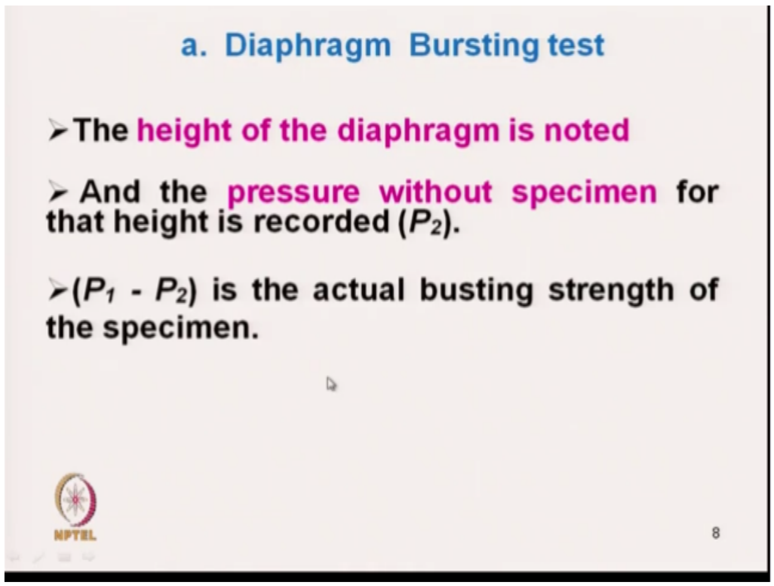

So, here the technique is very simple, now here some fluid we have to actually some fluid and here we are putting the fabric sample. Here this rubber diaphragm is there and when the fluid is actually pressed we are pumping the fluid here. So, it is pressed, so the diaphragm will get deflected and over the diaphragm the fabric sample is there. So, as the diaphragm get extended the fabric will extend and after that the fabric will break burst.

So, that and bursting means once the one of the directions either warp and weft direction breaks then it stop, that is the maximum pressure we actually measure. So, height of the diaphragm is noted ok, so the height of the diaphragm is noted and the pressure without the specimen for that height is recorded as P2. Now here the problem is that see the pressure which we are applying here pressure here is the pressure required to past the fabric.

And second is the extend the diaphragm at that level, so for diaphragm bursting, so during bursting 2 for to extend the diaphragm we require certain pressure. So, this height just before height bursting will note down the height ok h, so initially with fabric if we know the pressure required suppose P is the P1 is the pressure required and during that time we have to note down the height of the diaphragm.

And then without fabric, so if we extend the diaphragm at to that height, suppose that require P2 pressure. So, effectively for bursting the fabric alone we require delta P which is P1-P2. That is the actual pressure required to burst the fabric ok, that much correction we have to do. So, P1-P2 is the actual bursting strength of the specimen ok initially it was P1 then it has become P2 is required, so here what we have to do.

We have to test 1 blank test without fabric we have to test the blank test but blank test is normally done after the bursting of the fabric. Because we do not the extensibility of the fabric, so for that we have to note down the height and accordingly we have to carry out the blank test.

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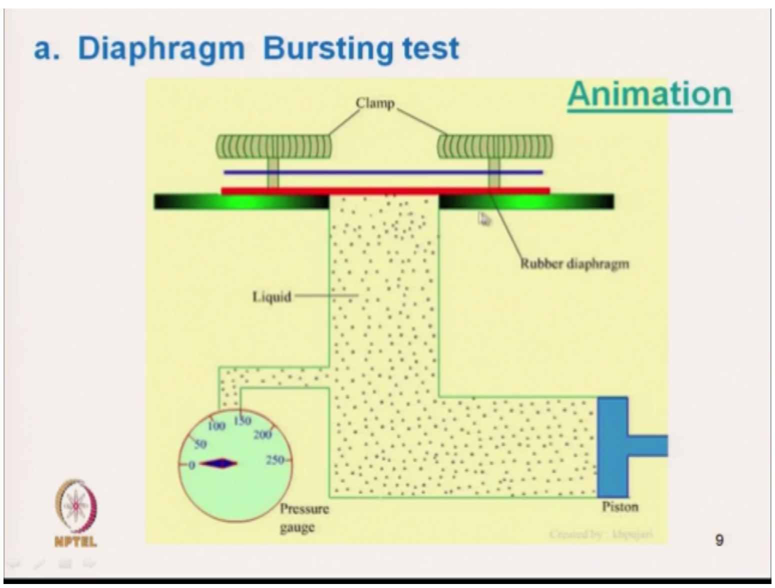

This is the bursting strength tester here this is the liquid here liquid is kept here and pressure is the applied using the piston here and pressure of the liquid is measured here by the pressure gauge. This is the pressure gauge and this red color it is a diaphragm and here it is a blue is the test sample here and we have to clamp ok. So, now let us see the animation here.

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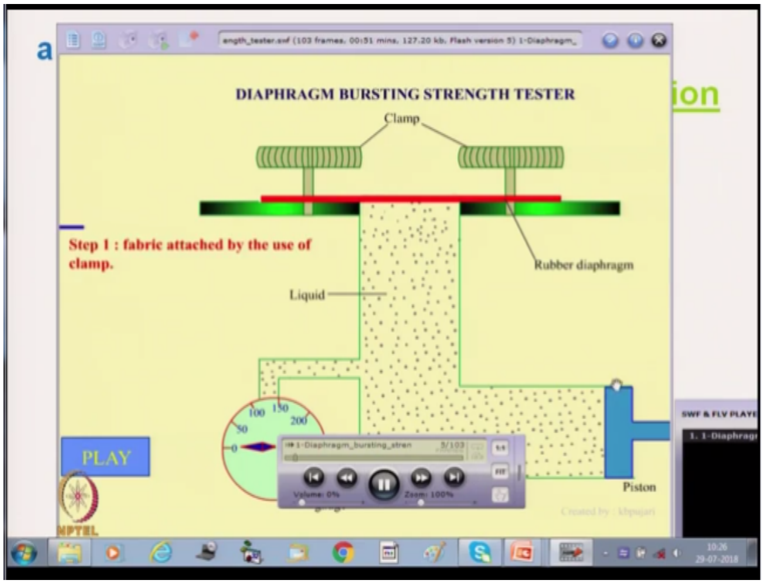

Now fabric is placed clamped ok, now it is a clamping we have tighten that it, so the fabric is clamped tight the there is no leakage ok. And then the pump will start pumping that it piston will be pressed inside. So, that fluid pressure liquid pressure here increases ok.

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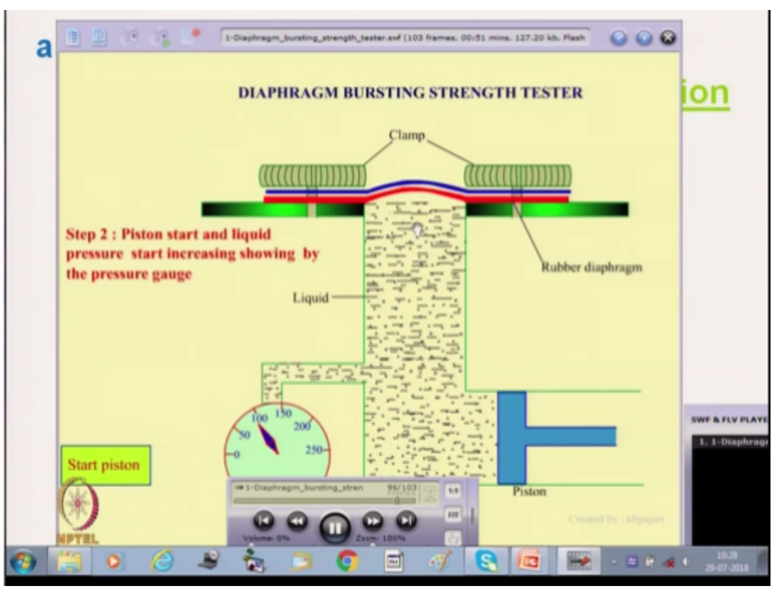

Piston is, so piston start the liquid pressure start increasing, the liquid pressure is increasing by and it is measured by the pressure gauge. So, it is a pressure is increasing and this diaphragm along with the fabric is getting extended.

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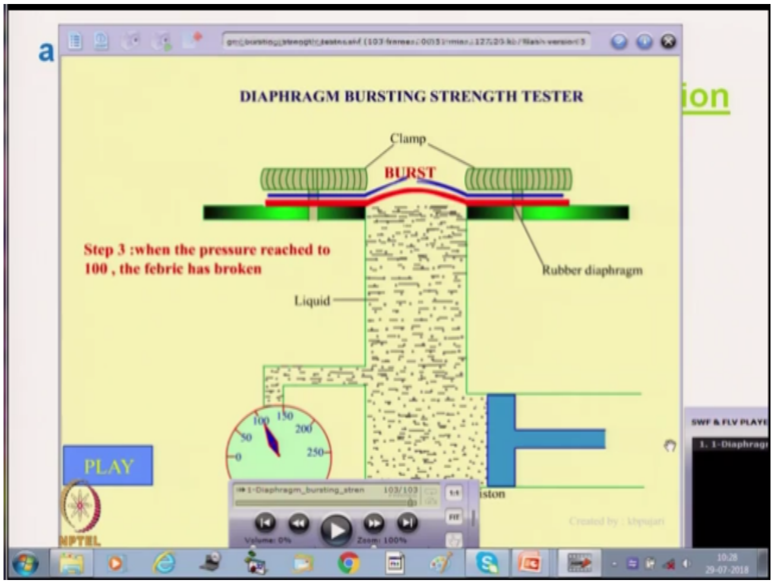

Now this rubber diaphragm is extending pressure is increasing liquid pressure and ion it is bursted. Once it is bursted you have to stop the pressure increase and then we can note down the pressure required to burst. And this is actually here it is a with fabric now we can calculate we can measure this height. This height is noted down and after that what we have to do, we have to test this is whatever pressure we are getting.

Here say 100 it is a P1 ok and this reach to 100 and fabric is broken bursted and it is P1 and after we will remove the fabric and we will again start the blank test and till this height is reached and then the pressure required will be definitely less than 100. Suppose it is a 50 then that 100-50 the 50will be the effective bursting strength of the fabric.

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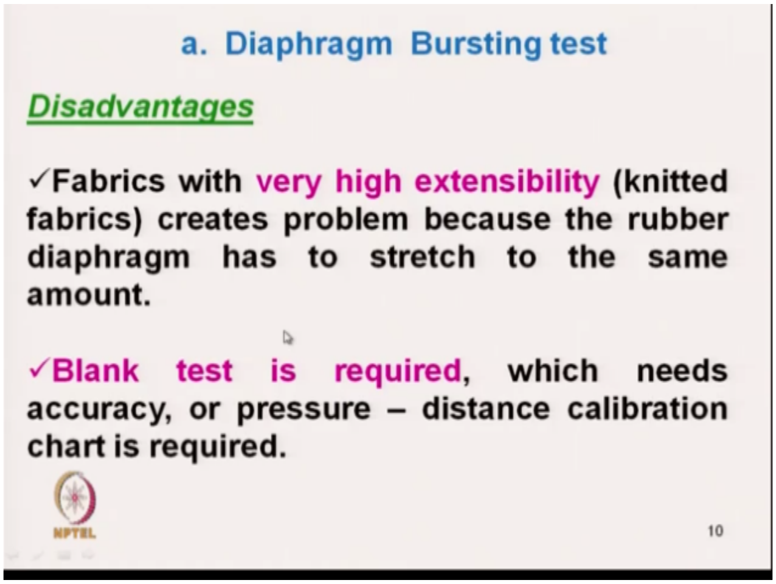

Main disadvantage of this type of this technique is that fabrics with very high extensibility like knitted fabric it creates problem. We cannot test knitted fabric here because the stretch ability of knitted fabric maybe much higher than the stretch ability of the rubber diaphragm. That means the rubber diaphragm will burst before the fabric burst, so that, so this type of method is not suitable for high fabric with high extensibility ok.

Like knitted fabric cannot be tested in this type of machine diaphragm type bursting strength tester. Only woven fabric and that to lower stretch ability is actually preferable and here as I have mentioned you need blank test ok which needs accuracy means accuracy in measuring height which is not that simple. So, there must be some extra arrangement to measure the height accurately, accurate height if we do not measure.

Then the P2 value will be wrong that will lead to the wrong interpretation of the result ok and this P2 value basically depend on the extensibility of the fabric. So, extensible if it is high extensibility high then it has to stretch more the rubber has to be stretched more. So, distance calibration chart is required, so that you have to calibrate the distance.

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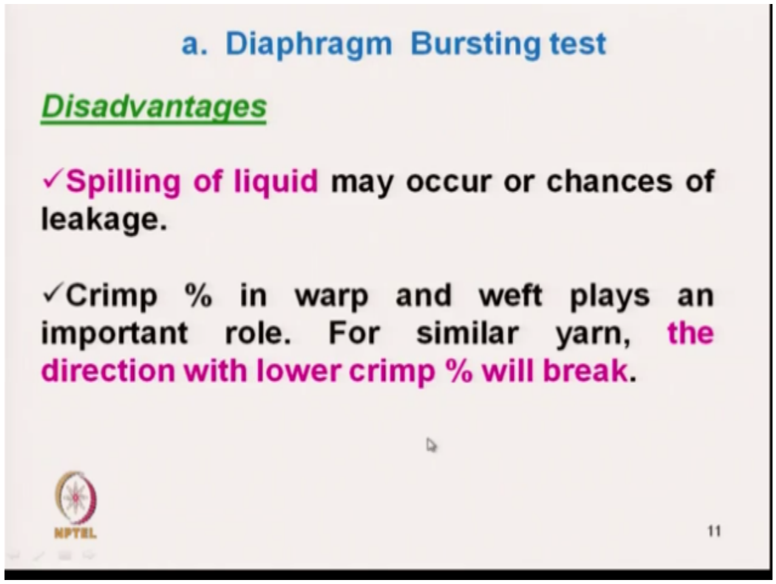

Other disadvantage is that this it has been observed that liquid spilling take place ok may occur. And that is by if we do not actually seal the instrument properly the liquid from inside may leak ok. Another thing is that crimp percentage in warp and weft plays important role that I have already mentioned, for similar yarn the direction with lower crimp percentage will break. So, that means that crimp percentage is actually important here it is overall in bursting it is important.

And when the stretch ability is high, so in that case we cannot use as I have mentioned the bursting strength tester that diaphragm type bursting strength tester we cannot use. So, we have to use another method which is called ball bursting strength.

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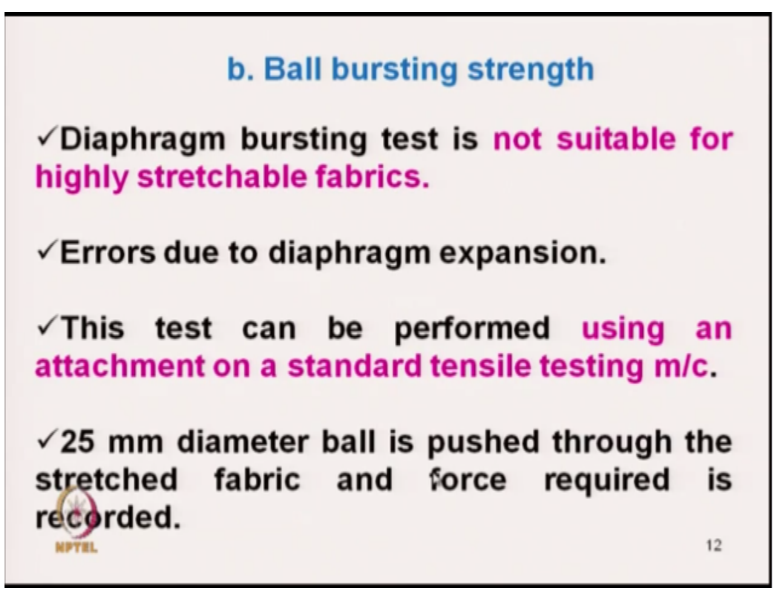

It is much simpler and for fabric like knitted fabric we can use and here normal tensile strength tester with some modification we can use it is simple here. Suppose there is a we have to have 1 annular ring ok annular ring is there and which is fixed on a it is platform of any say strength tester ok. And then what we are putting the fabric sample we have placing fabric sample here, this is our fabric sample.

We have clamped the fabric sample here ok and in the top this is the and from movable part this is the movable part of movable jaw of the tensile tester ok. And where this is the strength gauge is there ok and here 1 plunger with the ball at that circular ball at that tip. Now once this is moving down this ball will penetrate and will actually penetrate through this fabric and this fabric will be extended and till it is bursting.

This type of extension of the fabric will be there and ball is actually is pressing the this fabric and then it will show the advantage of this principle is that there is no limit of extensibility. We can said and we can actually press the ball against this fabric and the fabric will break and here it the load is recorded here. And this transudation is a compressive type load cell.

So, this will actually be loaded in this direction, so there will be a compressive type load cell and here in earlier in diaphragm type bursting strength tester we measure in terms of pressure ok newton/square meter or say pascal m some any other unit. Here it measures in terms of pascal but here we measure in terms of strength newton, so that these are the difference but the advantage of this machine is that here we can actually test for any fabric with any extensibility.

And another thing is that for many practical use this type of this situation takes place. Basically here the pressure through some extensible item is it is not applied in actual application like this is true this type of method is applicable where we are talking about the parachute type fabric ok. But if we talk about say geo-textile or any other type of fabric this may also be used.

So, both the systems are an useful but this the diaphragm type is say used for the woven fabric typically with less extensibility for fabrics with high extensibility, we can use this ball bursting strength. So, diaphragm bursting strength is not suitable for high stretchable fabric, errors due to diaphragm extension that is the negative point of that. And the test can be perform using and attachment.

So, this ball bursting strength testing we can just attach 1 extra attachment, the standard tensile testing instrument. That as I have mentioned so, 25 millimeter diameter ball is pushed through a stressed fabric and force required is recorded.

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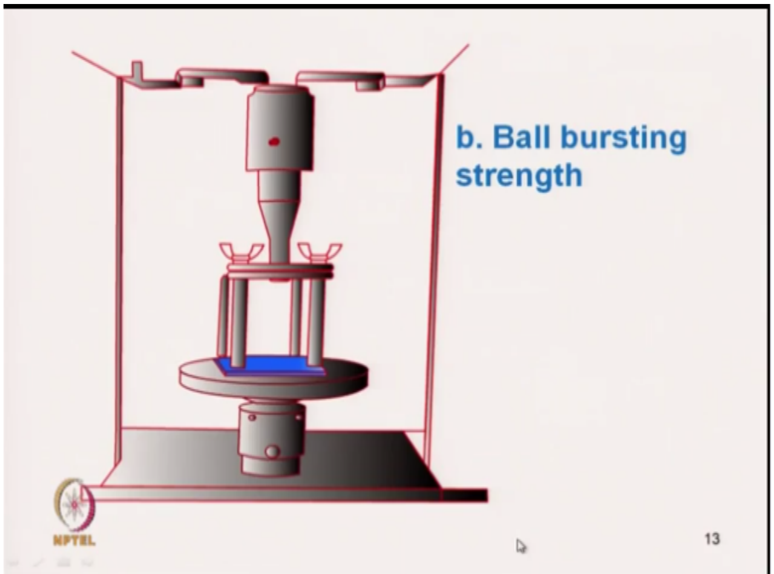

This is the arrangement that I have mentioned and here this is the ball is there at a certain diameter and stressed through the fabric, these are the fabric.

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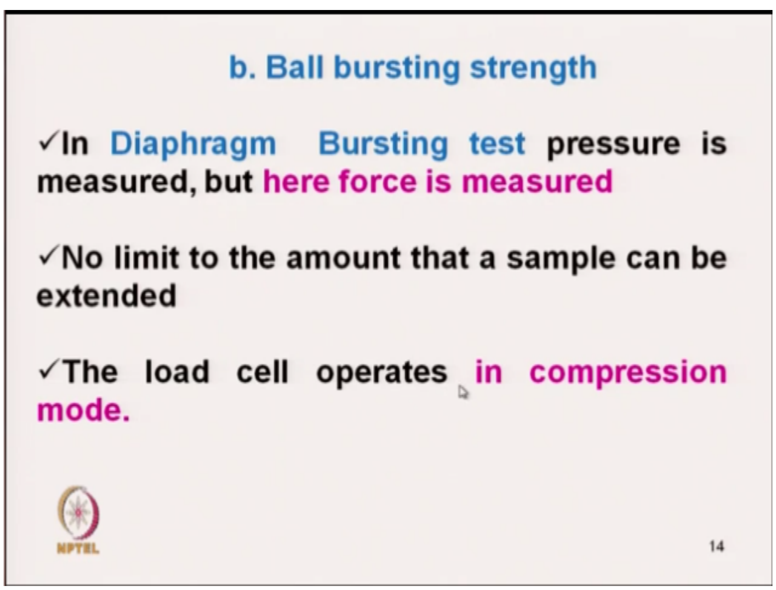

In diaphragm bursting strength tester pressure is measured but here the force is measured no limit to the amount of stretch is there. And the load cell operates in compression mode not in extension mode.

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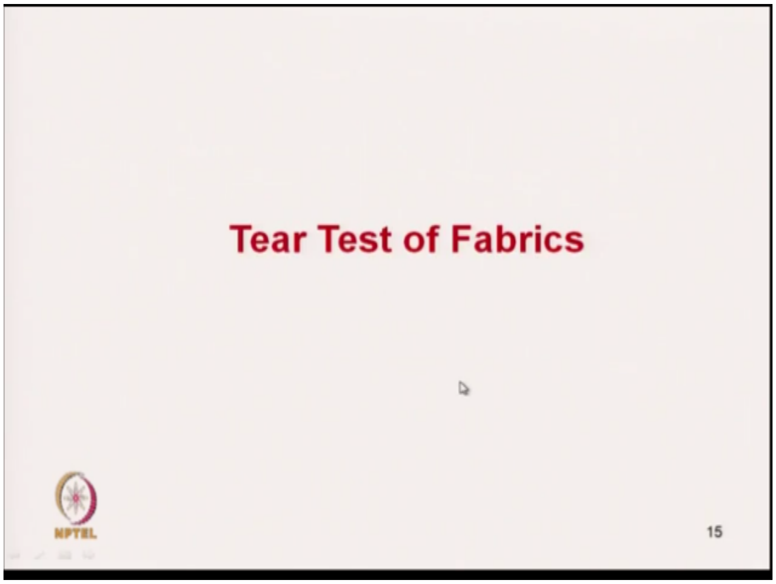

So, after the bursting now we will start discussing on tear testing which is also an extremely important characteristics not only for apparel type tester fabric but for industrial fabric it is very important ok.

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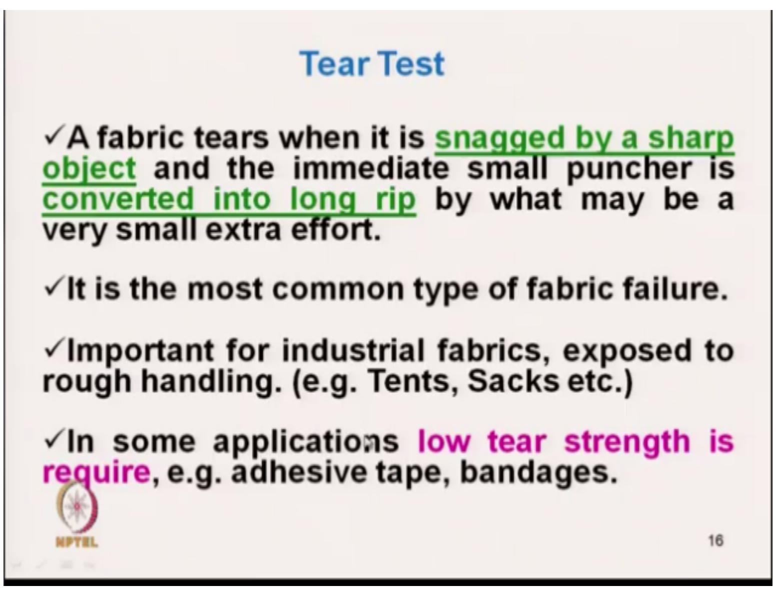

A fabric what is tear, now let us first try to understand a fabric tears when it is snagged by sharp object, so there must be some initiation otherwise tearing will not be there. This sharp object maybe some hook, some knife edge something some nails, so there must be some it and the immediate small puncture. So, some any pointed point puncture is converted in to long rip, so that is tear, so there must be some initiation and then there will be progression.

So, that initiation is by some sharp object ok any blunt object normally it is not they do not actually are generate any tear. And then the convert to long rip it is by a small extra effort. So, that if you start the tearing then the tearing will continue ok. It is the most common type of fabric failure that is the important and important for industrial fabric expose to rough handling like tents, sacks. So, there actually subjected to rough handling there will be some pointed object, sharp object and then this tearing will start.

In some applications we may require we require the low tearing strength like adhesive tape, bandages. So, this type of fabric we require low tearing strength and in most of the applications we require high tearing strength. So, we must understand the actually basics of the tear strength how to control the tear strength of a particular fabric. So we can control by controlling the type of yarn, type of weft, so let us discuss all this aspects here.

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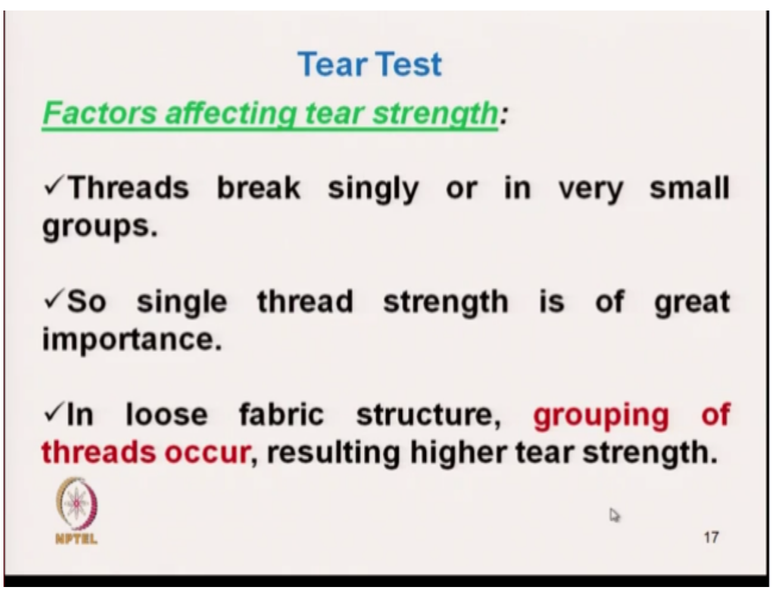

So, what are the factors affecting the tear strength how can we control the tear strength of a fabric. So, if we know if we see the fabric tearing either it tears singly single yarn one by one ok, so this is important here.

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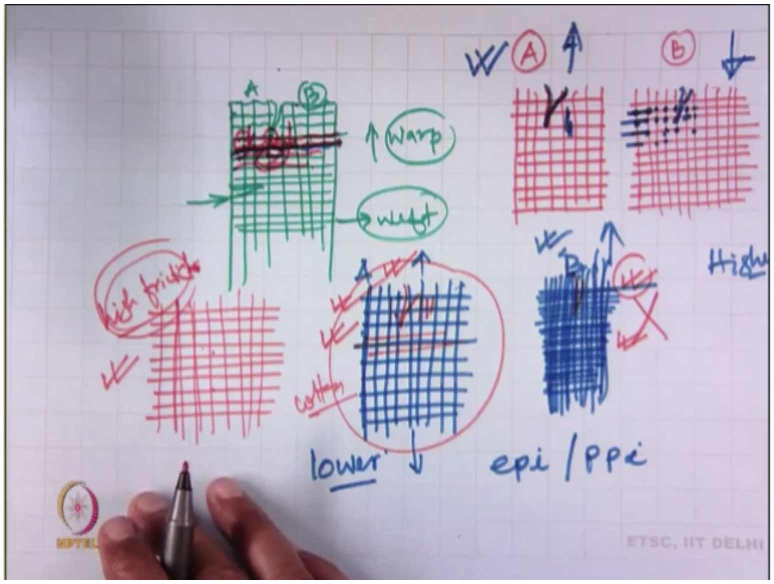

So, if we are talking about say women fabric and at this point say tearing start, now this yarns are broken. Now there are sharp object which cut this fabric this is weft and these are the warp yarn, now here if this direction, this is the direction this is the warp. This is the direction of tear then it is **it is** actually the tearing will is taking place in weft yarn, this is the weft yarn. Warp yarn is not getting affected, so this tear is called weft yarn.

And the other direction and if the tearing takes place this direction this will be warp yarn, in this way we can differentiate. Now once the fabric starts tearing, so this is say A side and this is B side, this 2 sides will get actually separated like this so, if tear is there.

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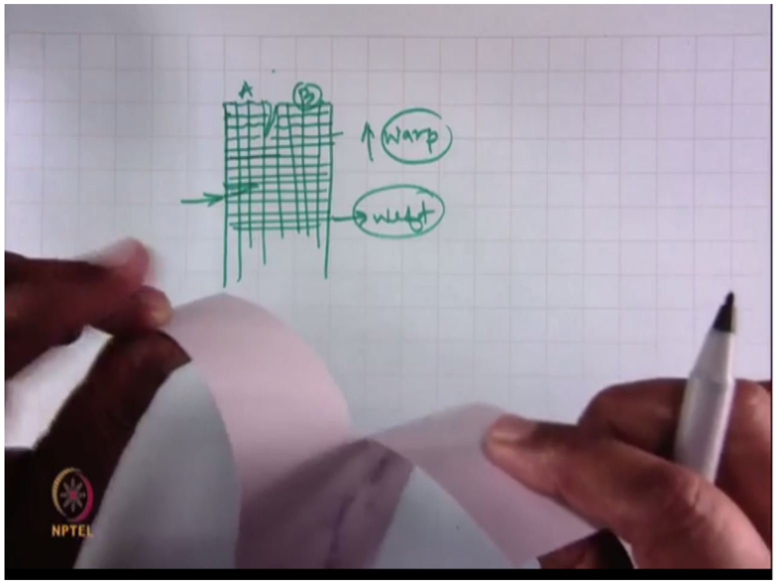

Now this 2 sides will get actually separated ok right and then tearing will occur and during this force on the last yarn. This is the yarn say means it is a first yarn here first yarn there will be a force lateral force which will try to push the yarn and form a grouping. If it cannot slide the yarn this yarn cannot slide then all the loads of tearing load will be on at this point of the yarn and then the yarn the single yarn will break immediately.

And then the load will be transfer to the next yarn ok immediately this load will get transfer to the next yarn and that yarn will break. So, sequentially the yarns will break and the tearing strength will be very low because individual threads are breaking one by one. As why because the arrangement is that the yarns are not sliding each other. So, this yarns are not sliding, so that is why this is this yarn they are breaking one by one.

And suppose we have made some arrangement we have changed the type of yarn, so that and type of structure this yarns are able to slide during the tearing force application. So, if this yarns are suppose sliding this yarn red yarn will actually come close to the blue yarn, so they will actually the red will not break. But red has slided to close to B, so close to this blue yarn, so they have formed a double yarn and this double yarn will again side to third yarn.

And in that way they will for a group of threads before they break and this is due to the sliding of the threads and this is grouping of the thread and ultimately we will see the tear strength is becoming higher and higher. So, basic thing is that control tear strength we have to take care that whether there is sliding is taking place or not and if sliding takes place in the yarn then the tear strength will be high.

So, one can have simple experiment suppose we are taking 1 fabric cotton fabric, so normal cotton fabric we are taking with relatively open structure. This is the fabric with relatively open structure fabric and here we are having say tear this is the tear direction. And from where we are we want to measure tear. Now this cotton fabric this is fabric A same cotton fabric what we have done only we have dipped into a starch solution simply we are dipping this fabric with the starch solution.

So, any size material we are giving and fabric become little relatively say stiffer does not matter this is for our experimentation what we are doing. And this fabric is B fabric with starch ok this fabric. Here again we are trying to we are we have put a cut mark for tearing, now what will happen here, so this they are same fabric A same yarn. Now if we test for tensile testing we will observe the there is no change effectively there is no change.

Because only simply we have dipped in light starch not heavy starch light starch, now if we test the fabric this is the raw cotton raw grey cotton, this is with starch. Now if we test the tear strength of this fabrics which one we will give the higher tear strength definitely the fabric will have fabric A will have higher tear strength and there will be significant drop in tear strength of fabric B why?

Because by starch treatment what we have done we have blocked this intersection with the tarch material ok. So, by doing these things what we have done we have actually stopped the free sliding of the threads, the threads are not actually sliding here. That means there will be sequential breakage of thread, so this thread will break first then this thread then this thread like that.

So, it will never reach a higher point but on the other hand the fabric A where nothing is there normal cotton yarn is there the due to the wax content and any other things this threads will keep on sliding. And then it will give a higher tear strength, now let us do let us perform another experiment same warp and weft yarns are there. So, let us take same warp and weft yarn and this is the warp yarn same say cotton yarn.

Same warp and weft yarns are used this is fabric say A and here and the fabric B where what we have done we have increase the inch/inch and peaks/inch. This is the lower and this is higher this fabric is compact fabric. So, nothing only this fabric is compact but this fabric is open structure same warp and weft yarn. Now what will happen if we test the tensile testing tensile strength definitely this B will give very high tensile strength.

Tensile breaking strength will be high in case of B and mass/unit because this fabric will be heavy. So, apparently this fabric is good because higher tensile strength and it will have higher bursting strength, so higher everything. But if we test for tear strength what tear strength we will see that this for tear strength this fabric will fail and the open structure fabric will have higher tear strength than this close fabric although they are made of same yarn, same warp and weft yarn.

And again the reason is that here the sliding express because of the open structure the threads will get it will get it will slide and they will have the chance of accumulation. So, in compact fabrics the threads break sequentially one by one. Here they break before breaking they actually accumulate and ultimately the tear strength is add, so that is a common phenomena fabric with open structure will have higher tear strength.

Similarly suppose yarn we have made same yarn same strength yarn of the same strength the A, B and now C fabric strength characteristics are same, stress strength behavior are exactly same ok. And epi, ppi are same but here this yarn which we have made here this is with the very high friction here what we have do. So, higher friction are this fabrics relatively yarn to yarn friction is low that means as it is high friction, so that it will actually prevent free sliding of threads.

So, in that case the yarn here with the lower friction will slide and then it will give here the tear strength will be high. This is actually we can test we take 1 normal yarn normal cotton yarn ok grey cotton yarn and the same construction if we say test with the scover or blist considering that bleaching or scovering is not decorating the yarn strength. So, in case of scovered or blist cloth the tear strength will be less than the normal cloth.

This is not because of the dropping strength if we test the tensile strength this maybe same if you consider they are same still the scovered or blist cloth will have less tear strength. Because of increase in friction ok, so the thread beaks singly or in very small groups. So, grouping is important, so if we think of the 2 fabrics 1 fabric is made of same yarn same ends/inch peaks/inch 1 fabric I made of plain woven fabric, plain view.

Another is say, so satin fabric will give higher tear strength because satin number of interments are less. So, threads can actually slide past each other easily and grouping will take place, so grouping is important, so we can play with the structure we can play with the thread density. We can play with the type of yarn to increase or decrease the tear strength, so single thread strength is of great importance.

So, strength single thread strength is definitely important this is actually showing off in the tear strength and in loose fabric structure grouping of thread occurs resulting higher tear strength. So, loose fabric structure as I have already explained.

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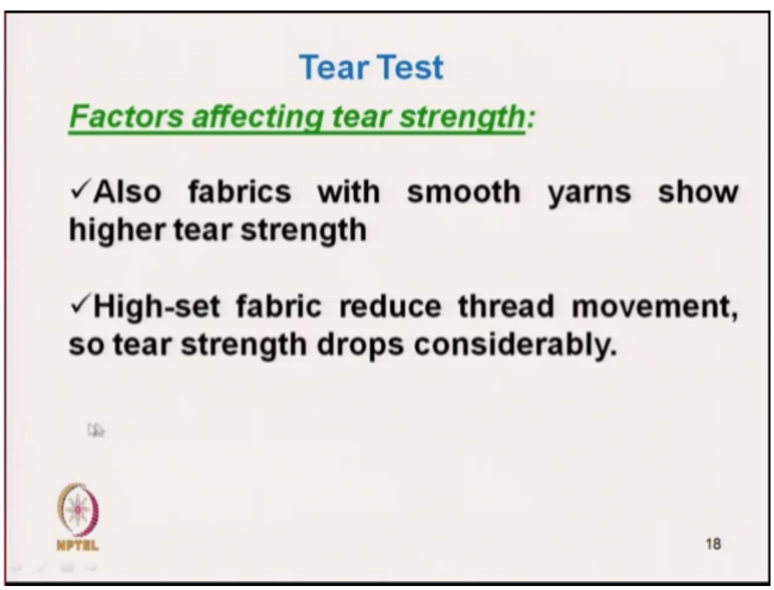

So, what are the factors are other factors also fabric with smooth yarn show with the yarn with lower friction like grey yarn will have higher tear strength. Because any factor which allows the yarns to slide and form group will increase the tear strength. So, high set fabric reduce the thread movement, so tear strength drops considerably, so if we increase the ends/inch peaks/inch that will drop, now there are different tear strength measurement ok.

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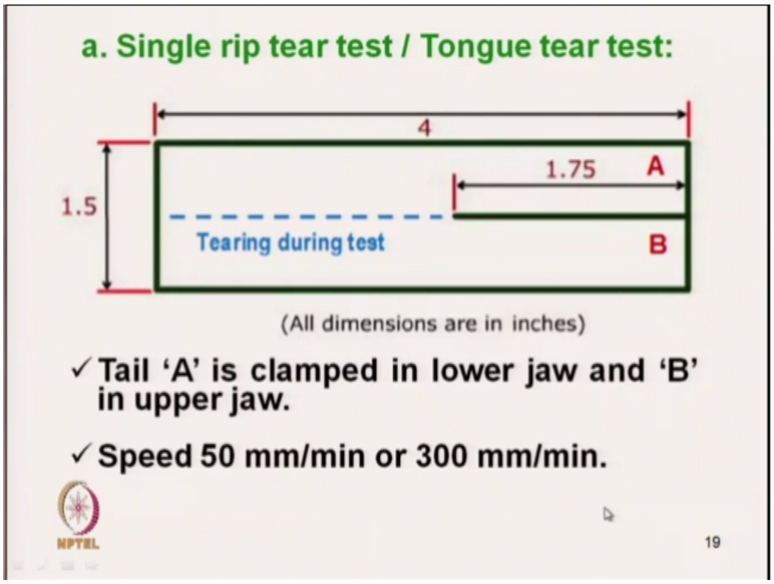

Now one of them it is called single rip tear test, so or it is called tongue tear strength, so this is a single rip tear strength. So, this is very simple test method where we test the tear strength.

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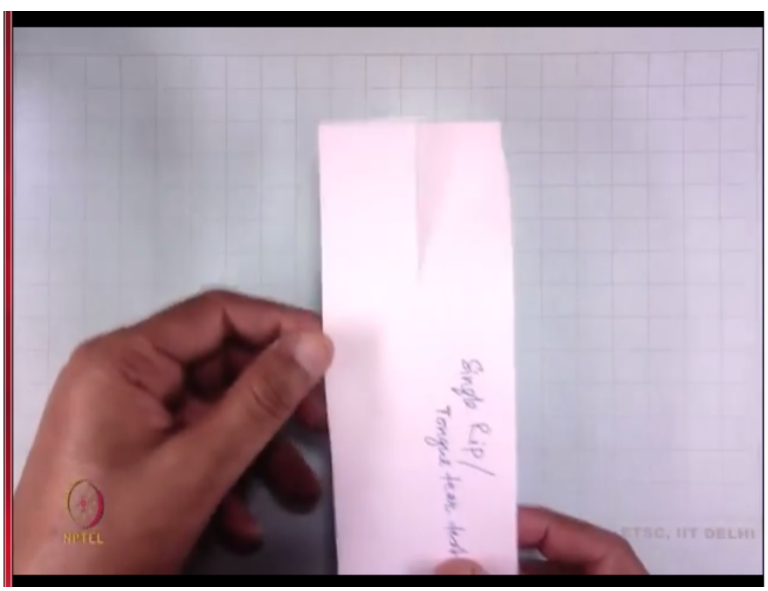

So, there is a strip fabric strip is there ok and here in the fabrics we put a cut mark and this cut mark we are actually after putting the cut mark what we do.

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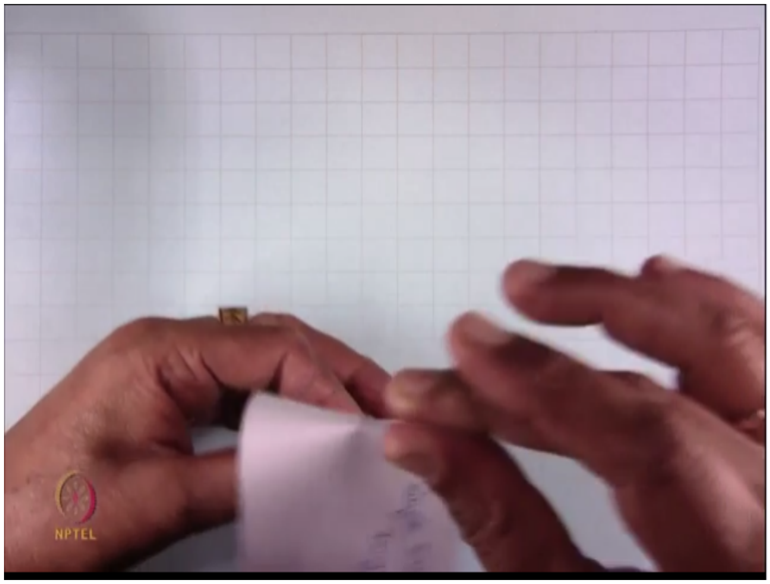

One side we put in 1 jaw of a tensile tester another side another part we are putting in the bottom jaw of a tensile tester. And we test in any normal tensile tester which works in CRE principle and then we keep doing the tensile test. So, this is the way we perform the tensile strength, so we get the load elongation plot, so maximum strength peak we can take as a redeem it goes through only one cut mark ok.

Here at the tail A is clamped with a lower jaw and B with the upper jaw, speed of the machine it is a non 50 millimeter/minute ok or 300 millimeter/minute. So, we can have different speeds as per the requirement.

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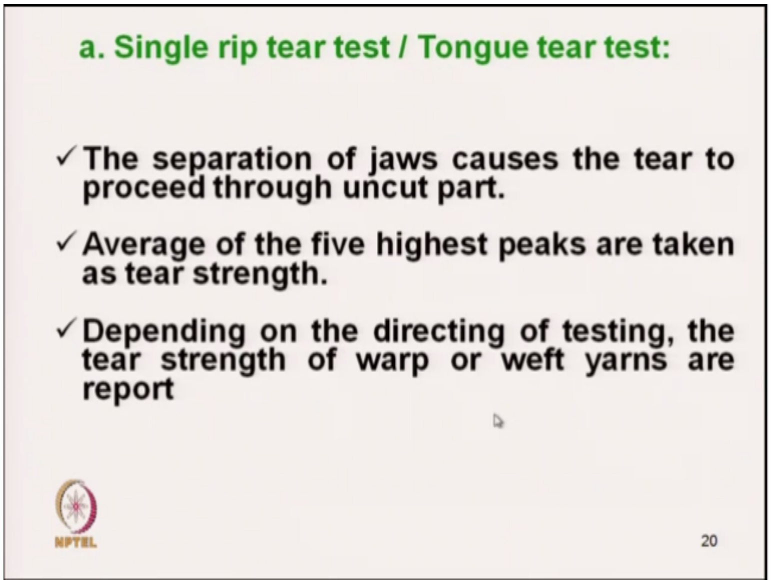

The separation of jaw causes the tear ok to proceed through the uncut part, so initially we put cut then through uncut part it progress average of 5 highest peaks are taken as tear strength. Depending on the direction of teared as I have mentioned the tear strength of warp or weft direction are reported ok.

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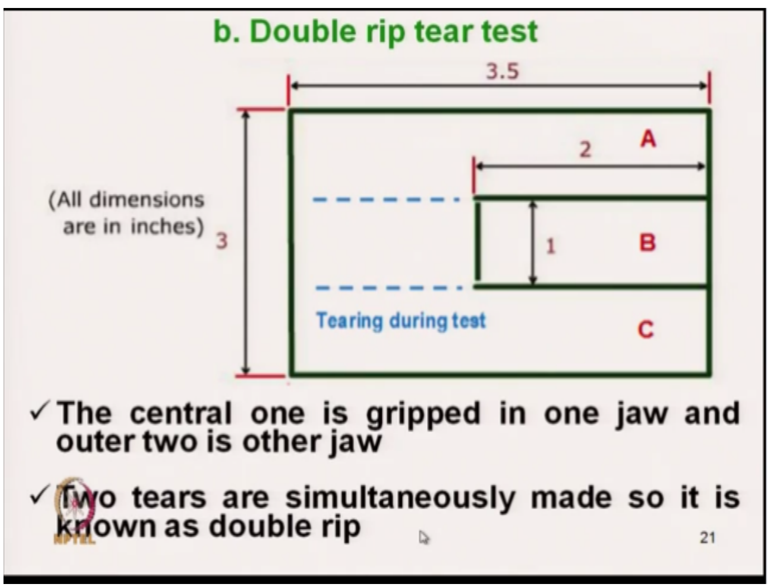

Next it is another method which is actually similar to the single rip tear strength it is a called double rip tear strength, here instead of single cut we put 2 cut.

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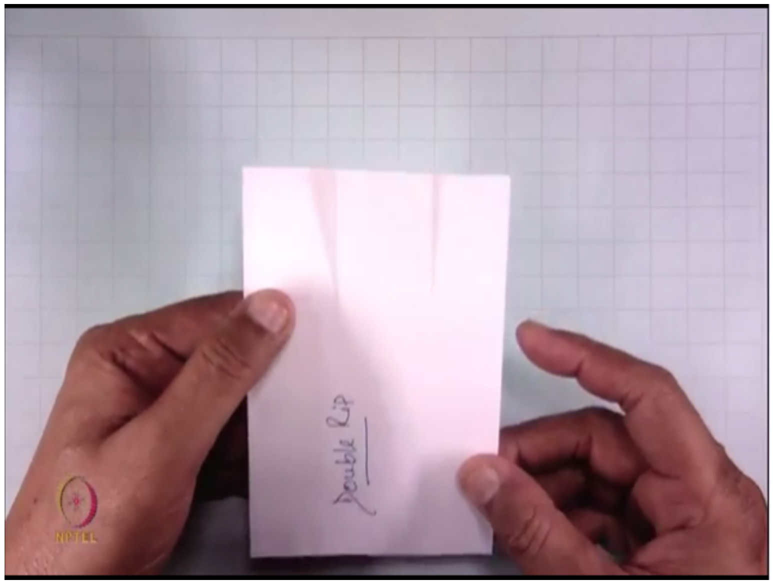

This is the double rip where we are mark 2 cut marks and this middle portion.

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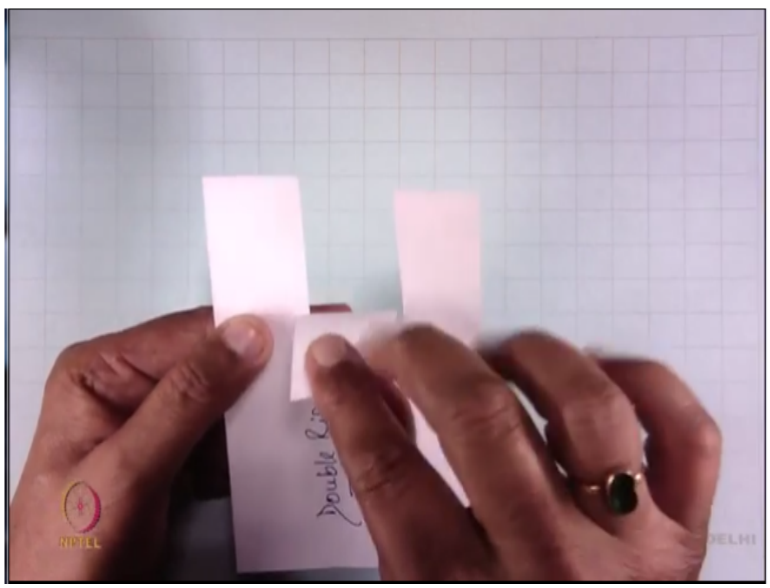

We are putting in 1 jaw.

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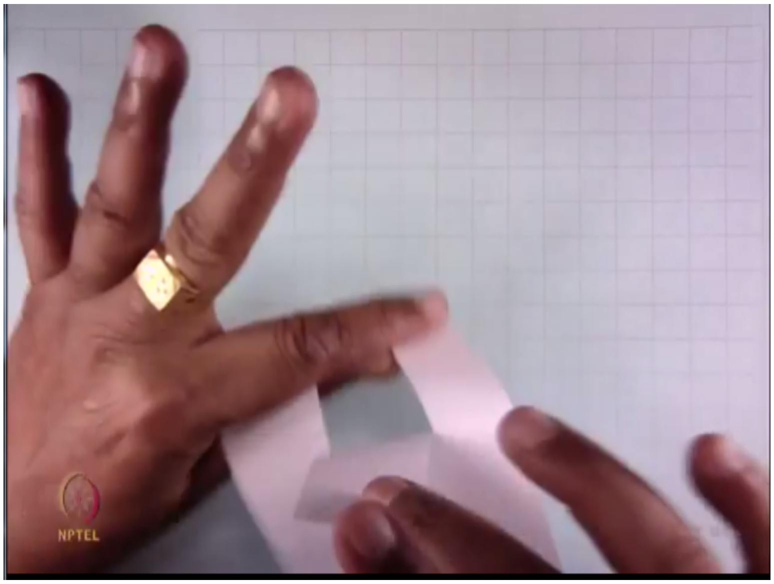

And bottom 2 portion we are making 2 jaw, ion this way we test ok then the tearing goes on. In this way this is the tearing. So, the similar way we can test here, the central 1 is gripped in 1 jaw and outer 2 in other jaw ok, 2 tears are simultaneously made, so it is known as double rip tear strength testing.

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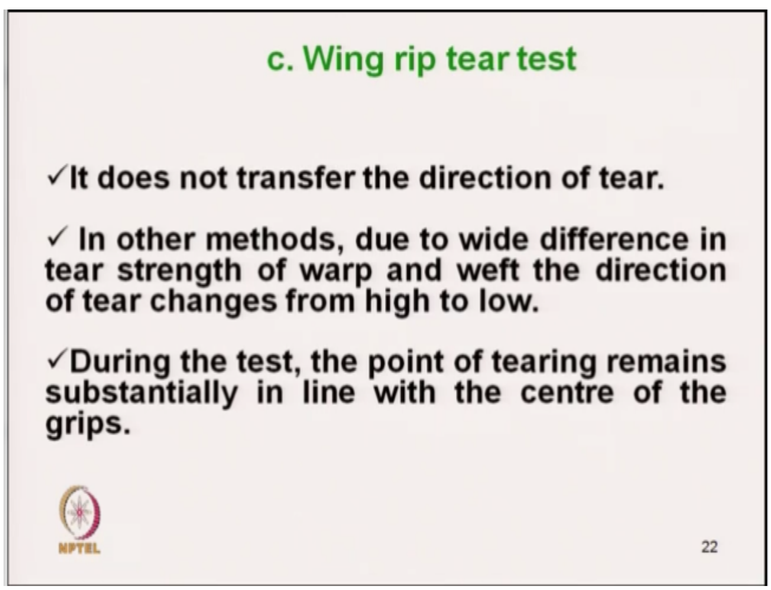

So, the main problem with this type of tear strength the single or double rip tear strength what happens.

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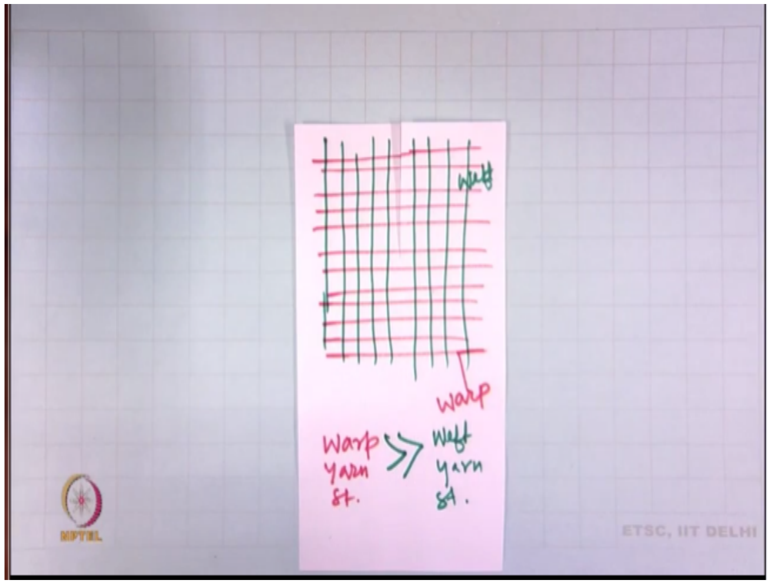

Suppose this is warp direction, so we on to say test weft direction this is say weft these are weft yarn and what we are doing this is these are the warp yarns.

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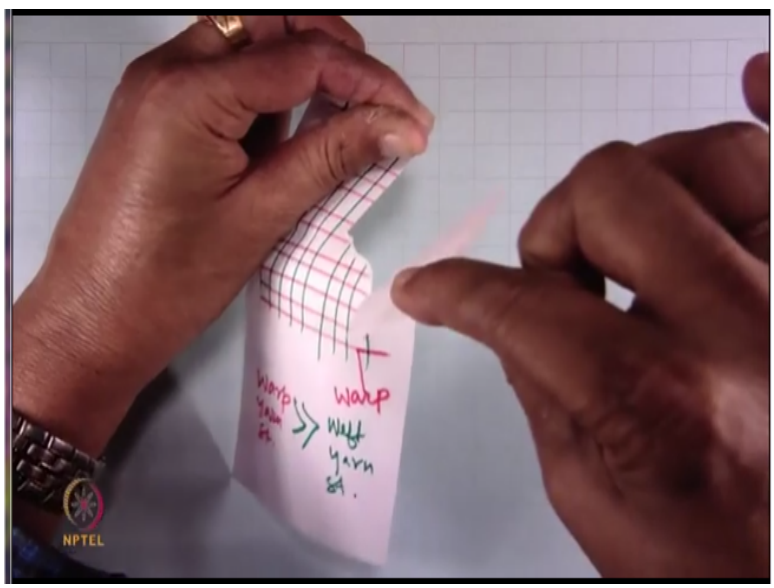

And in this this is this red is warp, now in this test what we are doing we are testing the warp strength, warp tear strength ok as warp yarns are broken. Now here if the strength of weft say warp strength warp yarn strength is much higher than weft yarn strength. So, warp yarns are very strong, wefts are weaker much weaker. So, if the difference is very high in that case what will happen if we try to test.

So, we are trying to break the warp which is stronger in that case what will instead of moving the direction of tear in this fashion they may change the direction and this type of take place, this type of tear will start taking place. because the load will also be on the weft direction as warp is stronger, so then it will it may so happen the weft means start breaking. So, this will give a wrong result, so to avoid this thing there is another technique which is called wing rip tear test ok.

So, what happened it does not transfer the direction of tear, in other methods due to wide difference in tear strength the warp and weft direction of tear changes from high to low ok. That is as I have mentioned and during the test point of tear remain substantially in line with the centre of the grip. So, in wing rip test this problem of shifting changing the direction is not there. Here the point of break is always at the centre ok at the centre of the grip.

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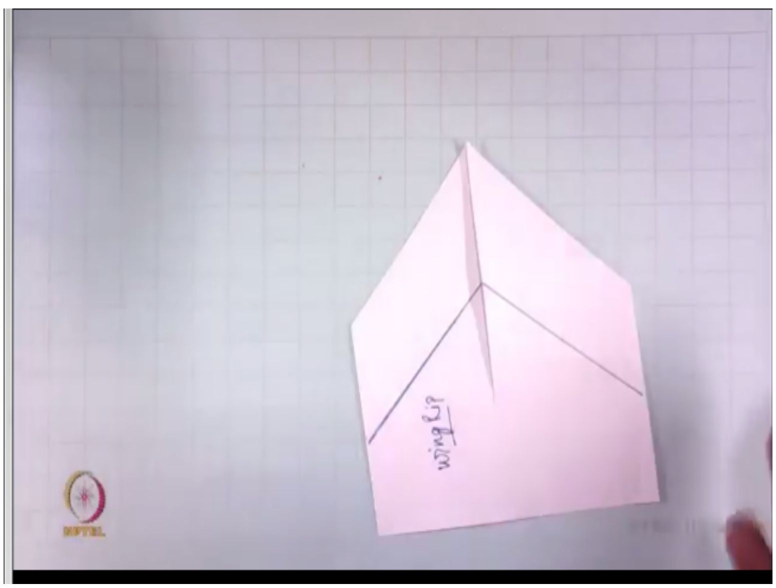

Now the system here is that the fabric this is the strip I have cut it you may not cut also just to show and we are having certain angle it is typically I think 55 degree angle ok. Certain angle we can cut here and then this is the direction where we can grip the top jaw is gripping in this fashion this will this direction this will be horizontal ok, this will keep horizontal this is grip.

And similarly this will be horizontal in this way we just grip ok and then we start tearing and the point of tear will be exactly at the centre of grip always. So, this is the say grip and at the centre of grip always this point of tear will be there it will never shift due to this arrangement ok. So, this is wing rip test just to eliminate the earlier problem.

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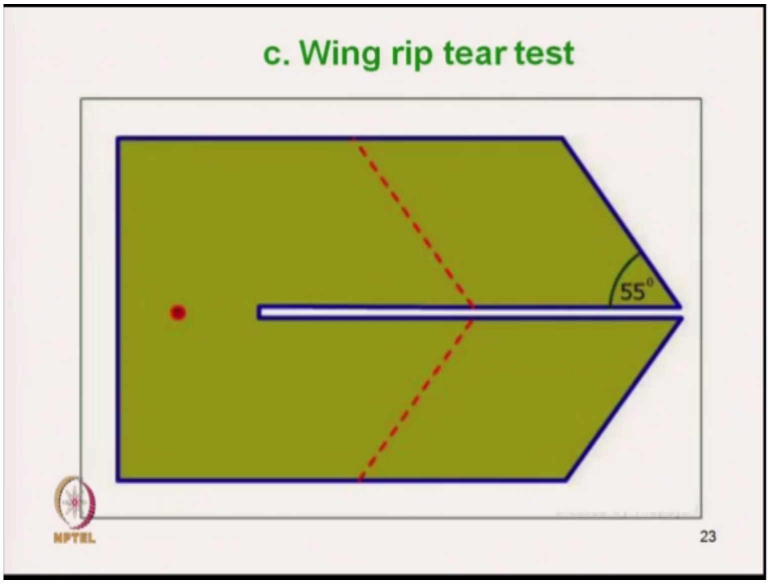

So, this is a 55 degree we grip this fabric.

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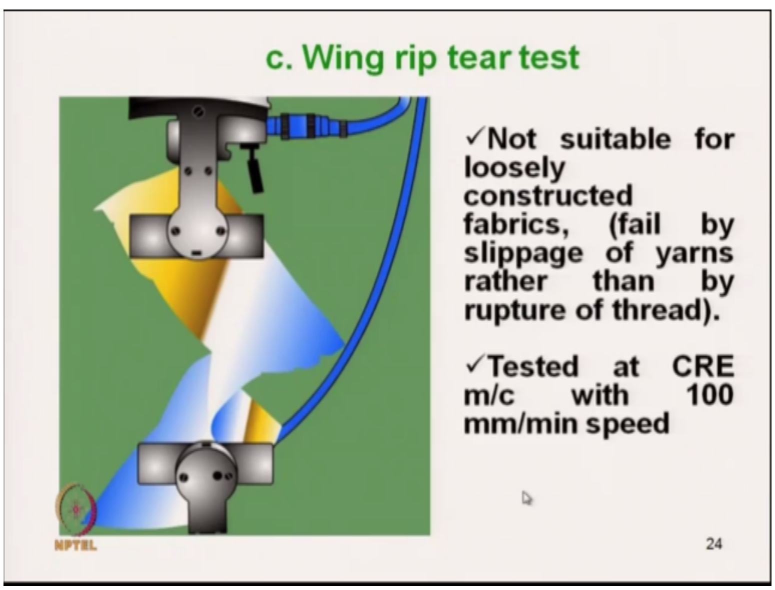

And this is the tester ok, here the point of tear is always at the centre of the grip so it will never it will not shift to other direction. So, this for this type of fabric even for non-woven fabric where there maybe some shifting due to wide difference in strength in different direction. So, for non-woven type fabric we must use this type of test because otherwise the tear direction may change ok, so wing rip test for technical textile we use it is not suitable for loose structure.

That is the disadvantage here because the arrangement which I have shown here due to this arrangement here the yarn sliding take place. The other test yarn sliding is not that prominent but if the loose fabric structure is there the yarn will slide fast and instead of tearing thus it fails with the slippage of yarn that is the main disadvantage of this type of testing.

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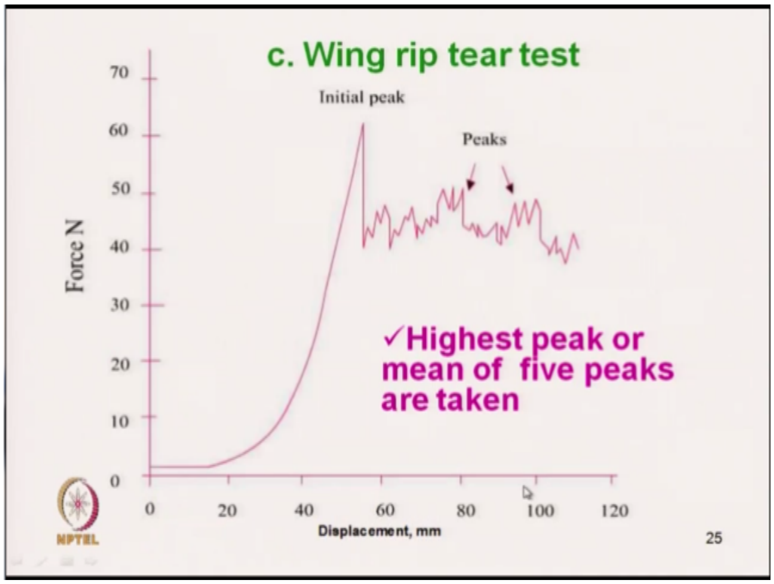

And test based on shear type tester and highest peak or mean of say 5 peaks are taken as tear strength ok.

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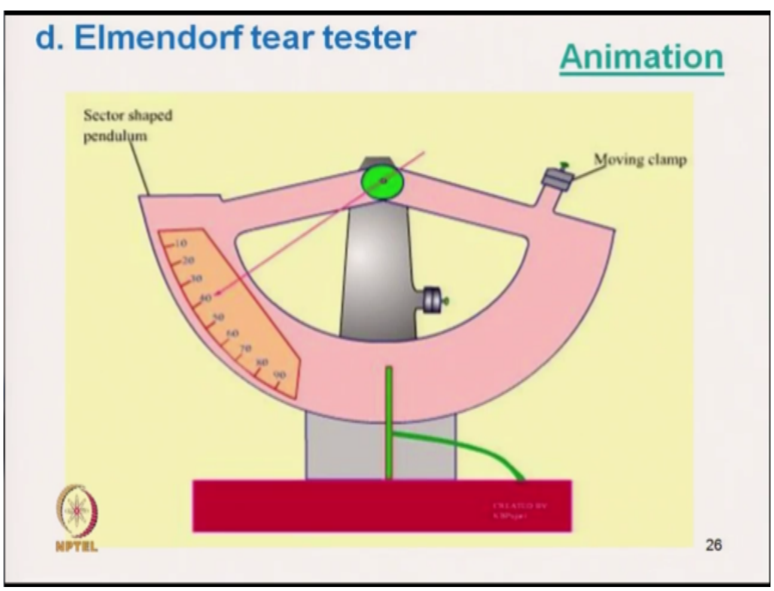

And the last instrument it is a Elmendorf tear test, here we do not measure the tear strength here we measure the tear energy ok.

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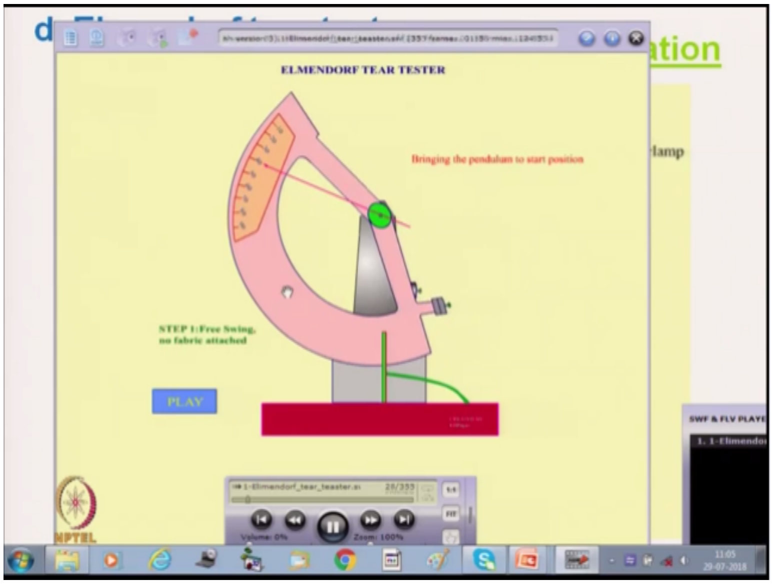

So, let us see the animation, initially it is we have bringing it to this pendulum the initial notion ok and here actually it is gauged the scale is there ok scale is there it is starts with the lowest value here. Lowest value it is 10, 20, 30 depending on the requirement, first what we do we have to test the instrument whether it is a working perfectly. The setting is perfectly, so initial a blank test is done, blank test. Now what we will show this is bringing, so it is a this is there and then we have bringing the pointer in the initial point and this is the stop.

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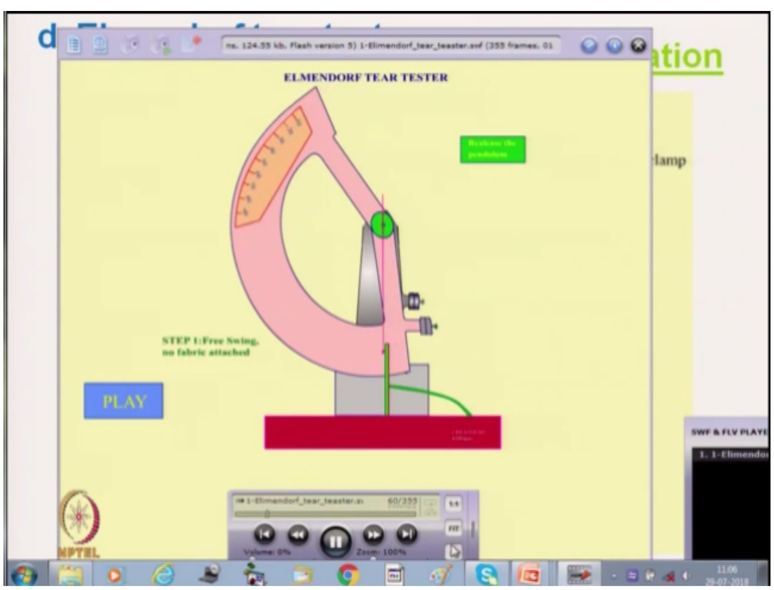

This is the stop arrangement, now we are releasing the this pendulum for blank test now it is released by pressing this stopper and pendulum is swinging and as there is no stress striction this should swing to it is extreme point. Because whatever the potential energy stored these are being released and this is showing the 0 point, this is actually reaching at the 0 point, so this pointer is showing 0 point.

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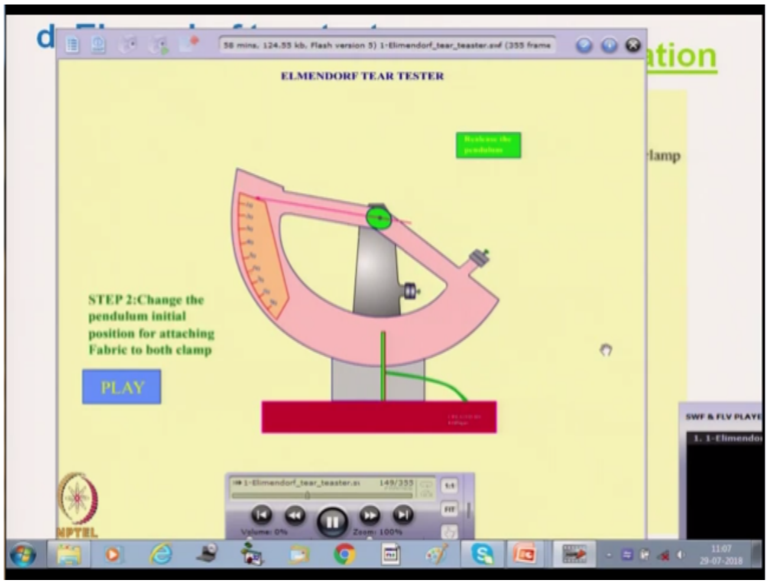

That means the instrument is working perfect, this is set perfectly now what we will do.

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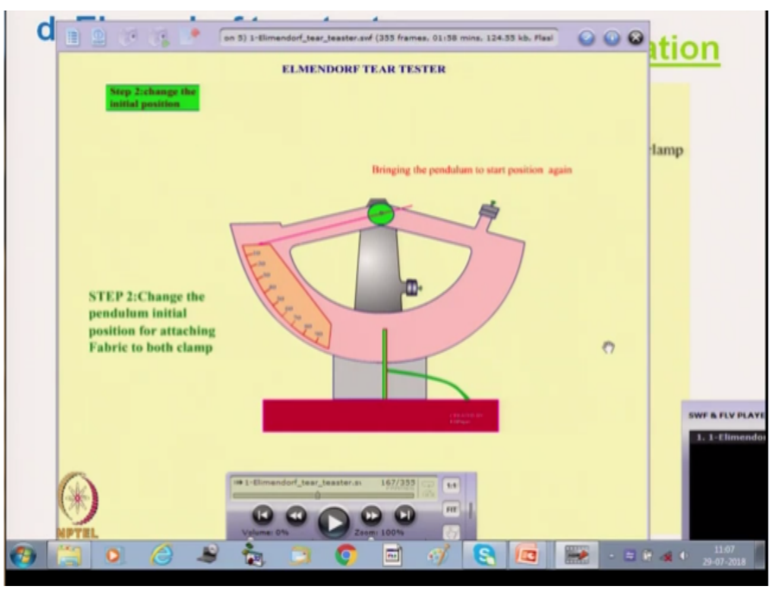

We will have to put the fabric sample ok now again we are bringing the pendulum to it is initial position ok and then bringing the pointer again it to initial position here.

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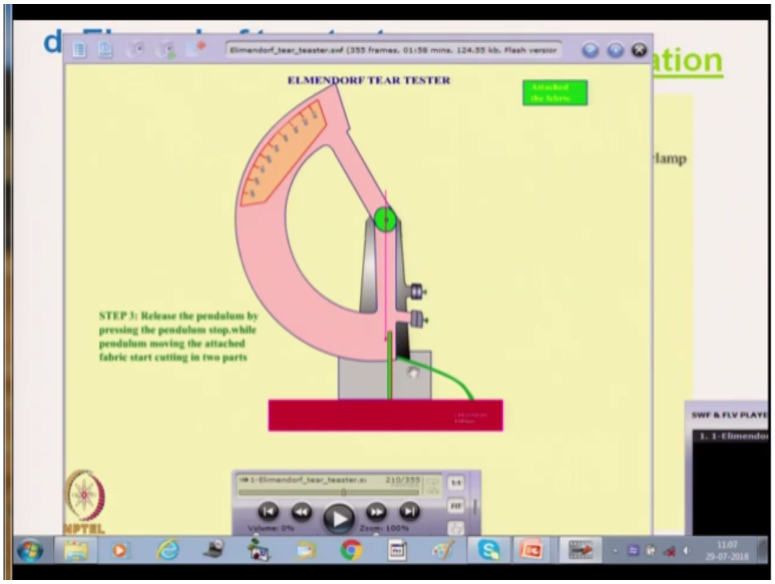

And then we are placing the fabric sample.

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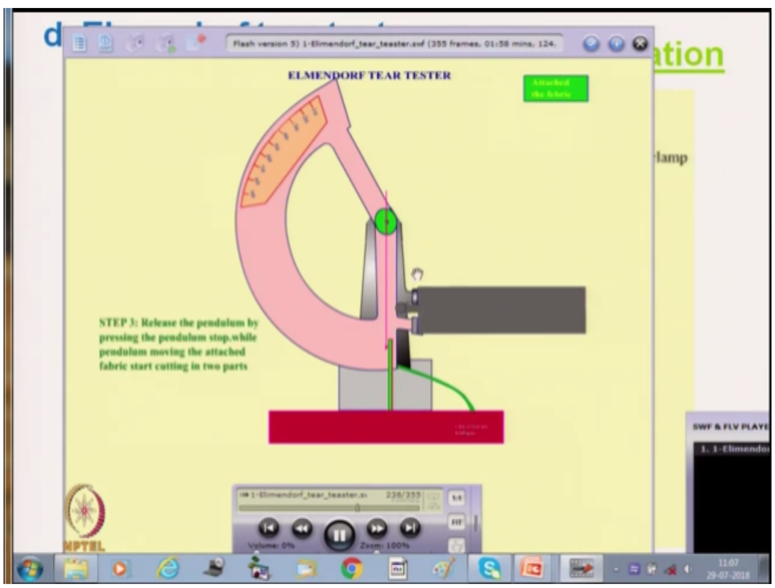

So, we have to place the fabric sample, now fabric sample is actually the as per the specification fabric sample is cut and it is gripped in the by this say.

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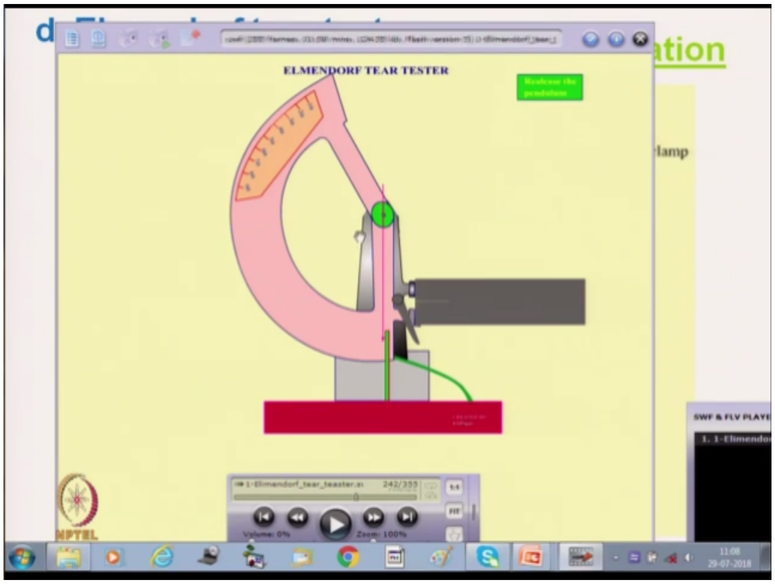

We are putting a cut mark standard cut mark by a knife which is actually at a part of the instrument, this cut mark is put here. So, that the it initiates the tearing, now once we release the this total pendulum, pendulum will swing and due to the potential energy stored here this will start tearing the fabric. Till it is fully tear and then if the tearing and then the pendulum will take some energy to tear the fabric.

So, it will not swing back to the initial position, so it will swing little bit less than that, that due it is directly it is a gauged here it starts with say 0, 10, 20, 30 depending on the tear strength, tear energy required it the pendulum will show direct reading.

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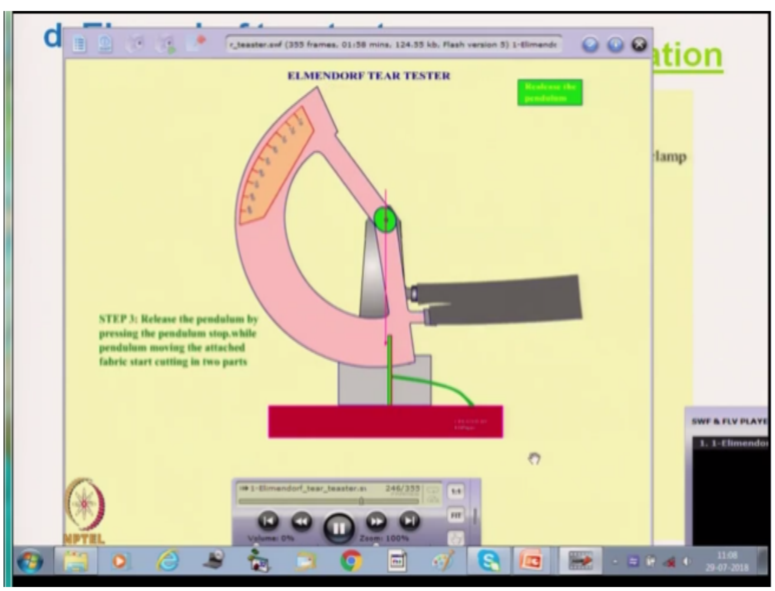

So, this gives the now it is started.

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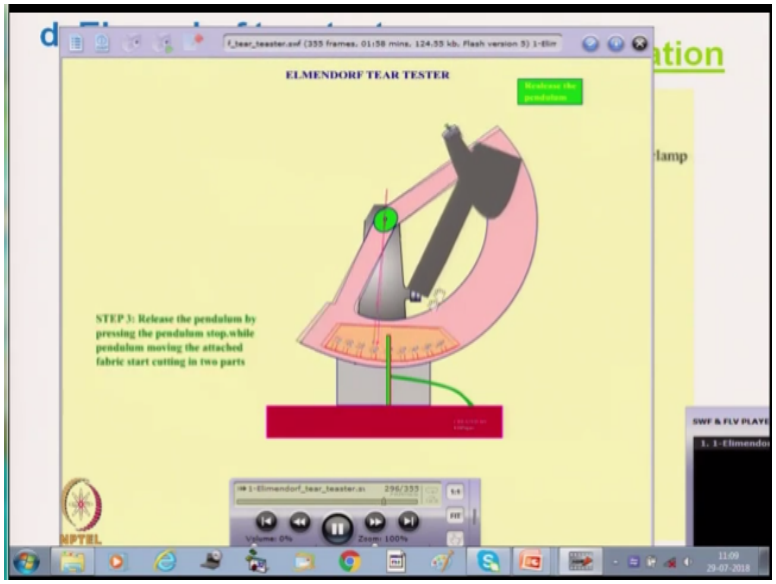

Now tearing will taking place although in this animation it is not showing the separation it will separate it will totally separate out and then it is swinging. But it takes some energy it is not going to up to that this point.

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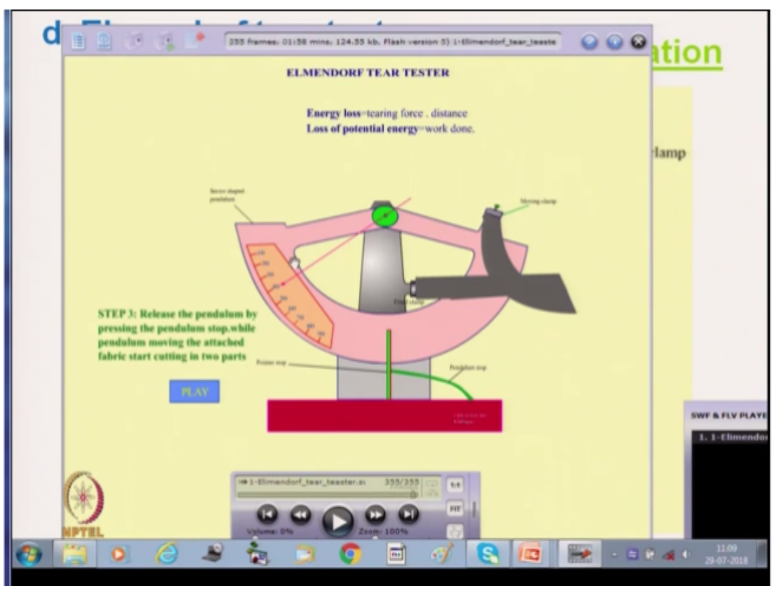

Here as per this it showing say 10, 20, 30 say 40, 40 is the actually the energy required with the vested energy required to tear the fabric. So, that is this 4instrument gives direct reading of the tear strength ok tear energy this actually element of tear strength tester it gives the energy to tear the fabric.

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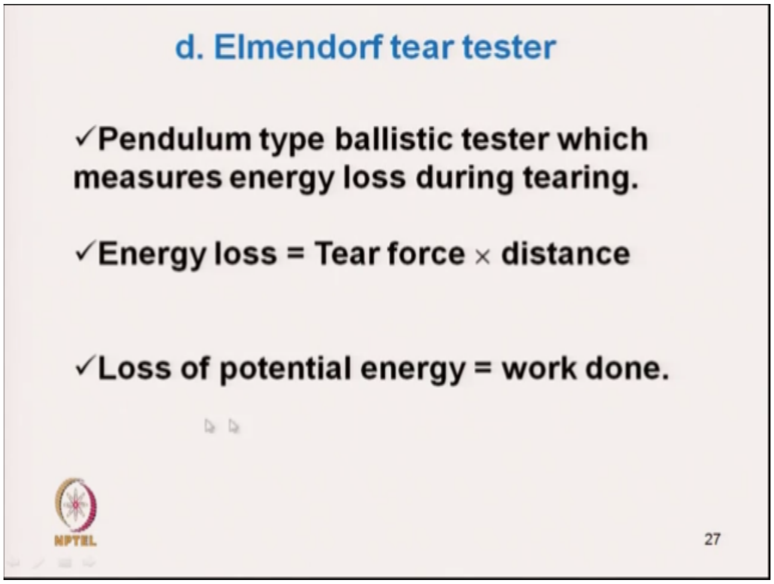

So, pendulum type ballistic tester which measures the energy loss during tearing, energy loss=tear force*distance, loss of potential energy that is work done and finish this session thank you.