Textured Yarn Technology
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General principles involved in the manufacture of textured yarns
Lecture – 03
General principles involved in the involved in the manufacture of textured yarns. . contd…

All right, so we are going to be in this particular lecture, continuing from what we had done before that is talking about the techniques the principles involved in producing stretch yards. Now we go further and if you go and check the principles involved in the manufacture the textured yarns may be on the modified stretch yarn.

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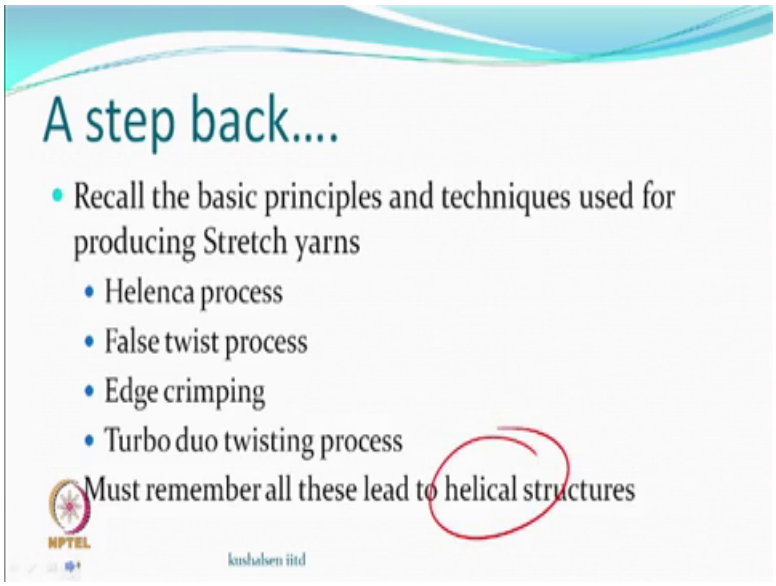

And so if you recall we had talked about stretch yarn which can be produced by Helenca process; which is a batch process. But it gives you helical structure because we are using twist, then there is a false twist process the twist is still being imparted, but in a manner which is slightly different this also gives you the helical structure.

Edge crimping is also a different process does not have a twisting mechanism, but till it gives you helical structure. And the turbo duo has a twist, but without a twister. It also gives you helical structures. All these processes which actually have produced stretch yarns had helical structure

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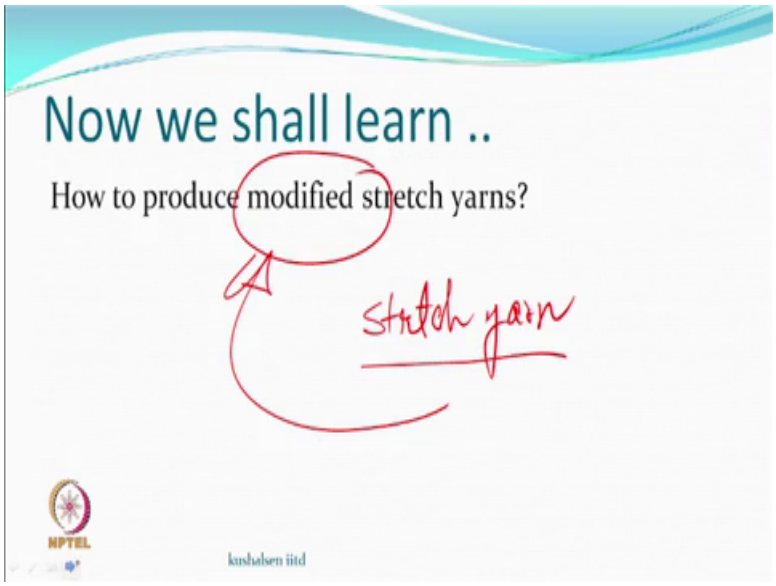

So, we go to the next step which is the producing the modified stretch yarns. And what we said basically is that for every application, we would not require a large amount of stretch. And therefore, we would reduce the stretch and therefore, the name modified.

Because first you produce a stretch yarn and then modify this yarn to get to another thing which is what we call as a modified stretch yarn. So, this is what we start and hopefully we will be able to continue and finish this particular requirement. .

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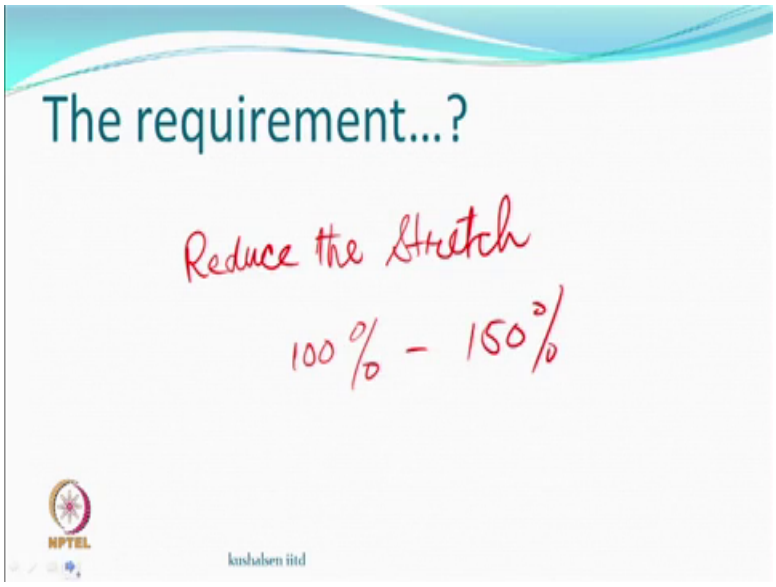

So, the requirement of a stretch yarn as we said is reduce the stretch by to the extent let us say we reduce it to 100 percent to 150 percent stretch. And the technique that we will see is something like that.

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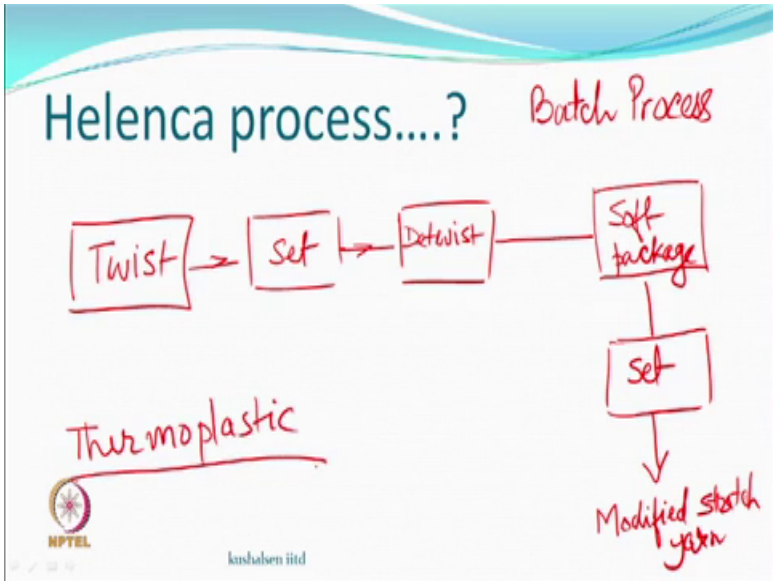

The same process which has been used for producing stretch yarn Helenca process which we understand is the batch process can be used to produce modified stretch yarn as well. So, we have principally first twisting, then we do setting for some type of a set and then de twist; this was our original process which was producing a textured yarn. So, now, we say that after this de twisting we are producing a soft package we try to understand that soft package means the density of the package is less. That means, the tension during winding has been less and after that we say another setting treatment. And then we say we will get a modified textured yarn modified stretch yarn.

So, the question that needs to be answered is as to what have we done we did say that the temperature requirement for the second setting may be different. And different in the sense that we are assuming here that we dealing with let us say thermoplastic yarn. If you do use a thermoplastic yarn, then temperature is the means with the heat is the means in which you can set; so you will have certain temperature

So, whatever temperature that you set up at the first heating cycle and the next one you will take less than that temperature. So, all the thing that have been done before are not going to be washed off. The memory will still remain, but something will happen. So,

what happens actually? Just because we have made a soft packageand just because we have try to reheat it what exactly has happened in this process. And we are also saying it remembers the previous memory also. How does the stress get reduced?

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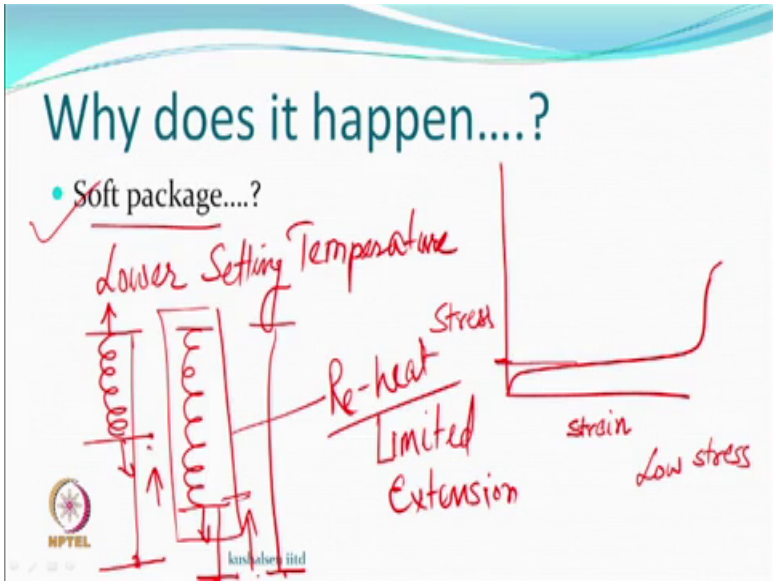

So, the trick is one is a soft package and the other is lower setting temperature. If suppose the tension was very high during winding, we had seen the stress strain curve that; is a stretch yarn has a lot of extension which is we will call a stress at a very low stress very low stress. That means, the winding tension if is above this value, you will have a flat yarn that is when you wind it will be just like a flat yarn it require that much stress only to ensure that all the crimps are gone

So, if you have winding tension like normal winding tension which we call as a right density package. We will get fully stretched yarn while it is on the package. If you do not heat, then there is no problem if it just stored and you can use it after unwinding it will start giving you the stretch it will start getting into the memory and give you the helical structure. But what are we doing now? May be during the winding process, we are making soft package tension is less than the winding tension and so there is a possibility that it is not fully stretched.

Let us say I have this is a situation of my stretch yarn. I pull, let us say I pull only downwards, then we will get extended length. If we have more tension may be we get fully extended yarn. When we have more winding tension then we will be winding a yarn

like this; if we have less winding tension may be we will be winding a yarn like this is that ok, can you see that right. And if we have no tension at all, then we would be looking at a yarn in this shape

So, if I reduce the tension or make to zero to such an extent that this is the straight which is there, now how do we measure less approximately? I will try to extend it to full length and then I will allow it to recover. And when it recovers it will go back to this state. So, if I do not put any tension, then this is the shape in which I will be reheating. If I put full tension then this is the shape in which I will be reheating. And if I put some tension which is different than these two values then my yarn would have been extended partially, so limited extension.

And what I do? I do limited extension by making a soft package I have reduced the tension, but not to the zero level. So, it will be partially stretched not fully stretched while it has been wound so you control here. So, you control your tension winding tension this will be controlled and it has to be quite accurate also. Because you know very small amount of stress is required to extend it further. So, within the small area or small limits that we have we would have to be working. And then in this state let us say in the case of thermoplastic I reheat

So, the changes that will take place in this yarn in the reheating cycle will be in the state which is different from the original state. So, we know that in a thermoplastic yarn the setting is reversible if you go to this higher temperature again all decreases that you may have formed can be removed. And similarly all that you have done in the first step can also be removed. And so we do not want to remove it we want to partially modify. And this is the process we partially modified.

Now, what happens is that why this is reduced stretch. Because now the new position is this position, the new position is this position the new position. And if I extend this further so this can go up to this limit because the fiber is same yarn is the same which is the maximum stress limit. And so when I will say remove the load it will go back to this position and not this position you see it will not go here it will go up to this position.

So, reduced stretch so you think now so simple trick that you wind at a lower winding tension, take it back to the auto plate at a temperature which is lower than the previous one so you are not wanting to wash off all the memory, but only part of it. And you get

set in a new configuration which now cannot; obviously, percentagewise will be able to stretch only this much right and so reduce stretch.

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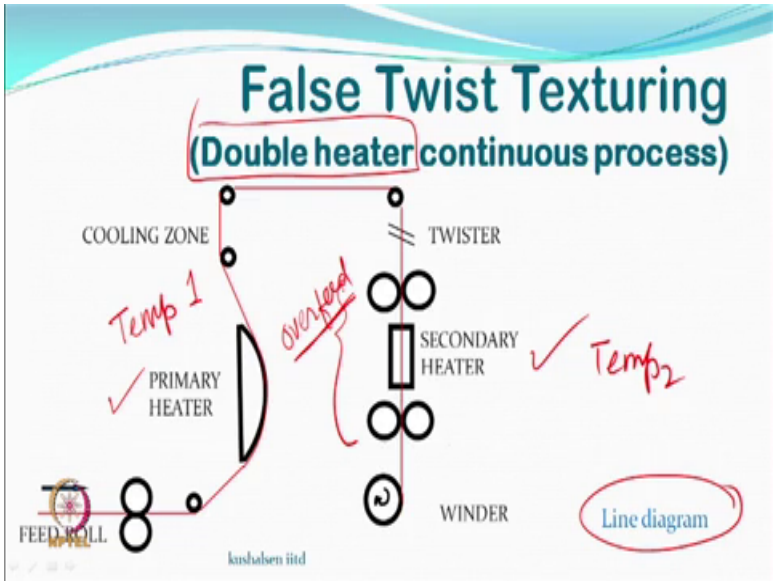

So, by using a Helenca process, we are able to get modified stretch yarns all right; how much stretch again depending on how much winding tension. Can we do something in the false twist texturing also which is a continuous process? Just to revise we have a feed roll, you are feeding the yarn, then you have a heater, the yarn moves over the surface of the heater, gets heated to a particular temperature. And then it gets cooled there is a twister which is twisting the twist flows down the twist flows down all right up to the nip of the roller feed roller and above the twister it is getting untwisted.

So, you get start with the parallel bundle of filament and theoretically you are getting out also as a parallel bundle of filament. Only thing that has happened in between is in this region you had twisted yarn, you had a heater and you also were able to cool it down. That is important that you cool it down before untwisting ok. So, this is how we produce stretch yarn. So, you want to do modified stretch yarn. So, now, we have two heaters one is called the primary heater other is called the secondary heater

So, up to this point which is the cooling part you have same thing. I have shown some bends the bends can be there bends may not be there it is a line diagram ok. Actually machine may be different that depends on whatever you want. And therefore, this is a double heater machine, but it is the continuous process and we wanted it a continuous

process. So, we are not making packages in between. So, it also has the primary heater, the cooling zone and the cooling can happen in this area also without any problem and then there is a twister ok

And this twister; obviously, the twist flows from here in exactly the same way it goes out then goes down all the way to the nip roller nip of the roller ok. In between you have heated and cooled and now untwisting. So, in a normal case we would have withdrawn the yarn from here. But now what are we doing? We are passing it through another heater which is called the secondary heater. And then there is another set of rollers here which is in between we have the secondary heater of course, there will be space this also will have chance to get cool, but And what do we remember now here? In the case of the Helenca the temperature requirements in this heater and the temperature let us say t 1 temperature one versus t temperature 2. So, the temperature 2 of the secondary heater is less than the temperature of the primary heater that is one condition which can be met. How do we meet the second condition? The second condition was if you remember the second condition was the soft package. So, we do not have a package here; the heater and it is a continuous process. At this point everything should be done finished. So, what are going to do?

So, if this zone we will give over feed and what does this overfeed do? It has less tension and therefore, the yarn is not fully extended. And because the yarn is not fully extended therefore, it is going to be set in a partially extended condition in the secondary heater. And if time temperature other conditions are optimum, then modification will take place, is it clear? Anything that you have any difficulty in conceptualizing this part? No issues and then of course, you wind.

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The distance between twister to the feed roller and twister to the winder is same, no this is not. And this as I said is a line diagram the twister to the this part will depend on whatever we were doing earlier, from here to here it will depend also on whether you have been able to heat it to the correct temperature. And then after that you would like in that condition to be cooled only we do not want winding to also take place while it is hot

So, the distance are not same they are going to be optimized. So, it would depend on what is the cooling mechanism, what it is the heating mechanism, what type of a yarn is

being used; nylon, polyester, polypropylene, all of them will require different conditions. And so this will not be same does it answer question, all right.

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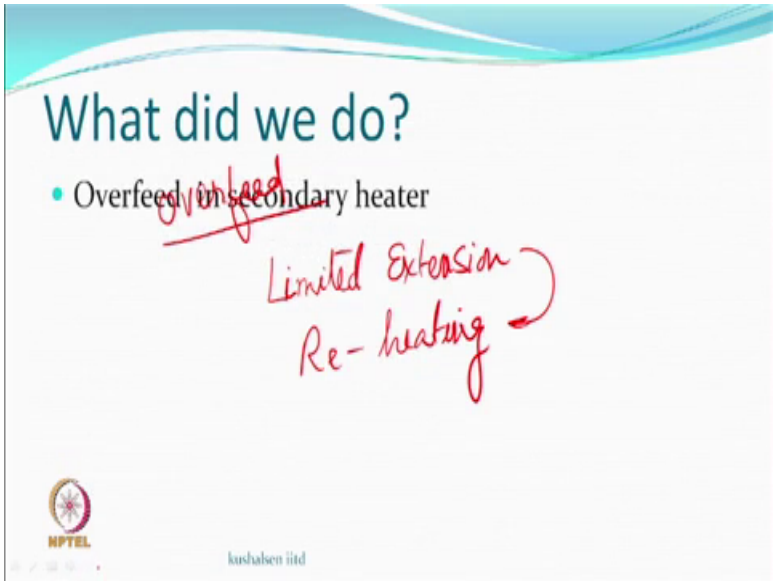

So, what did we do? Overfeed, means; limited extension you know. And reheating in this condition and then you get a modified textured yarn. So, we looking at principle so that is what we did.

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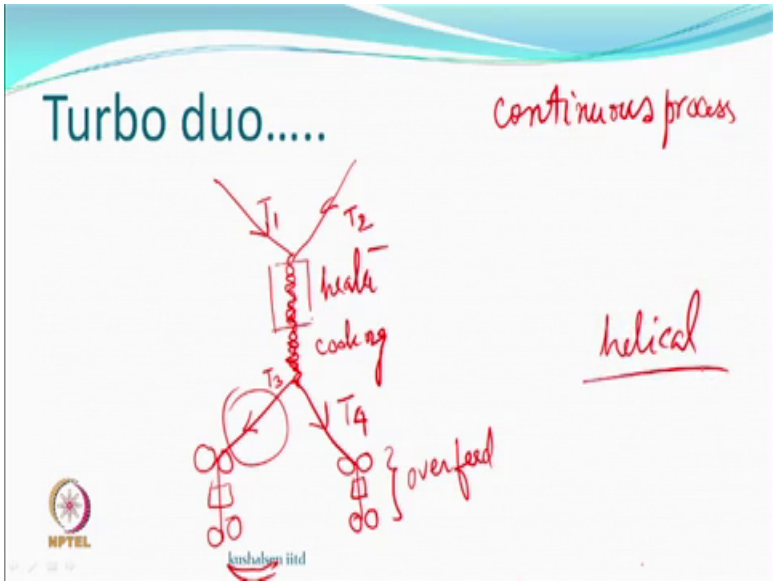

So, Helenca can be used to modify, false twist can be used to modify. Can we use this turbo duo process to modify? Can we use?

Student: No.

No, so some answer is coming here is no any other answer any response. Yes.

Student: Yes. .

So, it is called the dichotomy so either you have yes or you have no all right. Why do you think it should be no. Why should we think that it cannot be done? Because every time we say yes or no it should be backed up by some reasoning. How many people actually believe it is no let us put it this way you can raise your hand. How many people believe it is no. Even the one who proposed is not raising his hand.

That is that is ok. So, what we are saying is there is some confusion. But why should be there be confusion. Let us say what was our turbo duo process. So, our turbo duo process essentially was that you had two sets of yarn coming to a zone and they had certain amount of twist and then they were separated. In between you said we had a heater and you were; obviously, cooling also is this the process. Now we want to modify this can we modify now after looking a diagram. We can so what do, we do put a secondary heater it is a continuous process

Before winding can we put a secondary heater somewhere here yes no. Why not the cooling is done right so there is enough tension here remember? These yarns are under tension and this tension should be sufficient enough to remove the yarns from this zone. If we can remove the yarn therefore, this sufficient tension and. So, your helical structure is not being seen here it is a fully extended form all right. So, what do we do? So, we go to have take up you go to have a take up role and then you go to have another take up role. In between you can think of heater and overfeed

So, the difference is that after twisting and untwisting this is the untwisting process now you have two strands. So, you are going to have a two heating cycle two heater systems at least both the yarn must be treated individually now all right. And then work it out you should be able to get all right. So, as a engineer you can always find a solution in case you think it is principally correct if you really think the principally it is a wrong idea then; obviously, you will not find a solution. But if you believe that principally it is it should be able to done I think this could be a possibility and you would be able to get a modified stretched yarn, make sense.

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Then we have the edge crimping. Before that what would be the structure of this yarn helical or something else? We have done nothing so it will be still helical. So, the edge crimping we recall the edge crimping. So, there is a edge and the yarn is being taken and there is heating cooling cycle let us assume. So, what do we do? We do not answer this

You will design a process using edge crimping technique to produce a modified stretch yarn whenever you have time all right. So, should be possible or no. So, only design is an issue. So, everybody should worry about their own design. Just design it and put in a note book you do not have to report to anyone. We will find out sometimes.

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So, if you summarize we have modified stretch yarn being produced by all the four methods. One is called the Helenca multistep process, other is false twist texturing, edge crimping, turbo duo twist and all of them still give us the helical structure. So, while it is an interesting thing to note that the stretch yarns do have helical structure even modified stretch yarn can have helical structure. How much they will stretch depends on whatever done to them. So, it is not that just because there is a helical structure. Therefore, it will give you the maximum stretch now you can reduce that also. So, the process is therefore, will be modified accordingly. Where do we go further?

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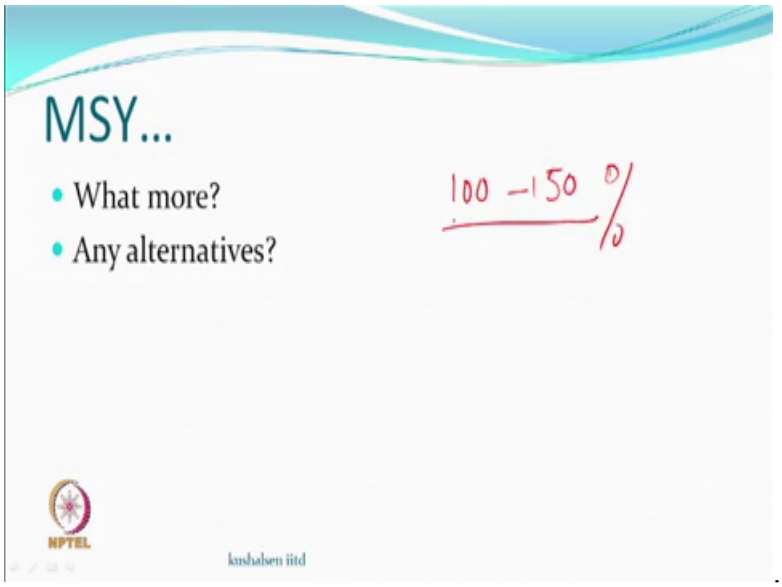

MSY; that means, modified stretch yarn. Can we use any of the other technique to get through the modified stretch yarn? Must remember one thing that we say what can we do we are expecting the expectation is let us say reduce stretch or the stretch value less all right. This is also a range the range should vary also there is can you can we use any other technique any other alternative and that will be interesting to know right. So, let us see what do have.

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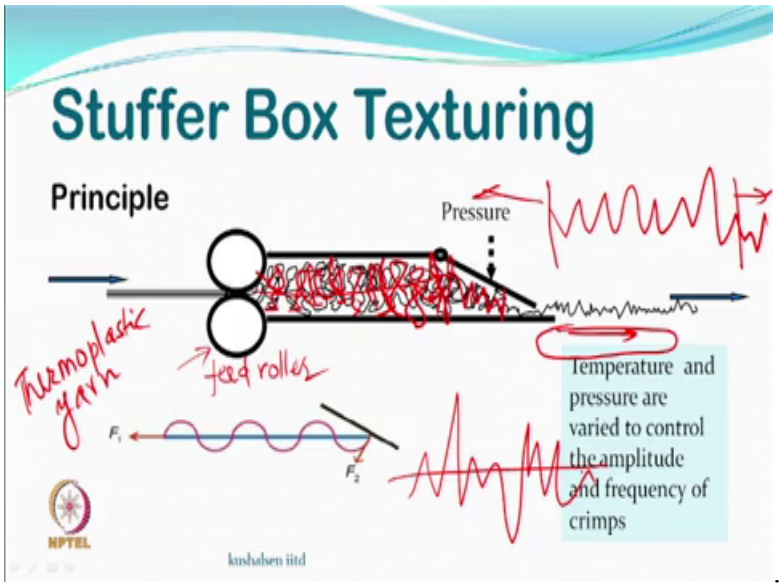

Have you heard of this term may be before stuffer box texturing. It is a very simple thing it looks like a box therefore, it is a box. You stuff the yarn into this therefore, it is called stuffer box. Finally, you get something called a textured yarn therefore; it is a processes stuffer box texturing. So, what do we have in thing? There is a feed roller. So, you have a feed roller and this pushes the yarn into a box this is the box all right. So, this is our box and then there is a system with which you can if you push it hard, this can be thrown out of the box

So, there is a wall being created by let us say door or a flap which; obviously, under certain is under certain pressure. Let us say the pressure in this area becomes high and this pressure is low the whole thing called a plug will be moved out will be thrown out. But you can change the pressure therefore, output from the other side would be would not be able to just pass through it has to strike. So, the yarn in the beginning let us say would just be forced and may start collecting here then fold here then the fold here and so on so forth

The yarn is getting at a particular speed if you keep the mass balance the yarn must also get out from the other side approximately in the same amount. If you particularly the extended mass approximately. If suppose this is also thermoplastic material. So, what are we doing is we must have some way this is called the deformation mechanism; when you throw against a wall the yarn bends. If the yarn is at room temperature their bending behavior will be different

If the yarn has been heated then it is bending behavior will be different become soft. So, that is ok; that means, you have a controller. The pressure at this you have a controller the speed at which you can throw the thing has a control. So, although this process is so simple you have to do nothing just keep throwing the yarn into the box yarns. And the filament there of will bend and so the crimps will be generated. So, the yarn which comes out will be something like this which means that if you extend it should be possible for you to extend

If you have set it correctly, then it would recover also ok. So, interesting part, the interesting is very simple process just throw something in the box it will bend as it bends you heat it set it and after setting you can remove it under low tension so that the crimps remain it will get cooled. Let us say there is a conveyer system and then this is collected

winded ok. Now this principle is being used have you if you have seen the staple fiber making industry. Whether is the viscose industry or the polyester or any other thing will make staple

So, they use this technique to crimp very simple. Of course, the temperature require may different then use a polyester yarn or fiber which has a crimp crimps are required is not it in the fiber for spinning to facilitate spinning carding etcetera you require certain mode of crimp. So, nature fibers have crimp so synthetic fibers are given the crimp. But those crimps are not suppose to be very permanent they just suppose to be good enough to make sure your process takes place and after that they are not so much interested in the crimp

But when you are looking at texturing; obviously, you are interested in the crimp to last. And here we are not going to be cutting them into staple it still remain a filament yarn. If you want to cut no problem, but this is hard tool so simple process; so says the amplitude in a frequency could be controlled by temperature and pressure. So, it is not a completely uncontrolled process, but definitely all the crimps are not of the same size it could be randomly. But you would have an average crimp height and average amplitude and frequency.

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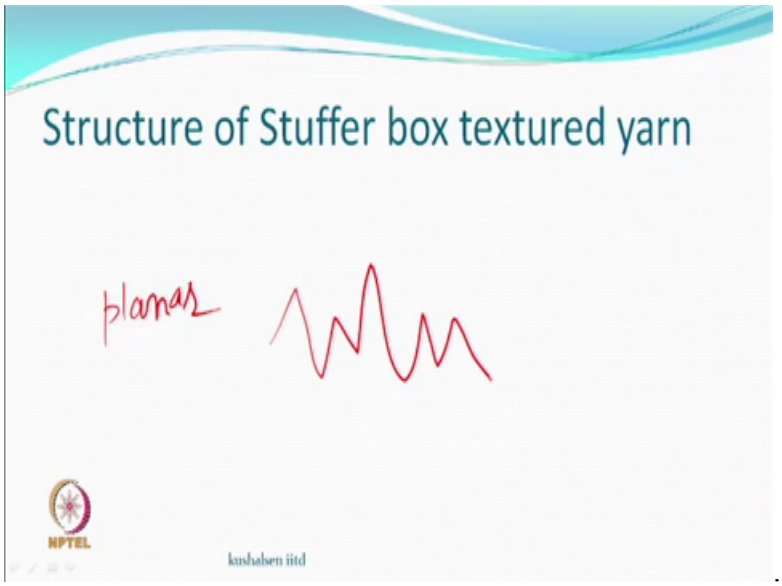

So, the structure if somebody wants to know is it helical.

Student: No. .

No. So, it is going to be called a planar structure. So, it is approximately just a name. So, the crimps are bending in the same plane. So, yarn is bending so the plane remains. So, the bend remains same. So, it is not really helical three dimensional type of structure, but very simple is not it.

Now, the range the stretch range approximately comes in the same range as we modify the stretch yarn. So, they come in the category of the modified stretch yarn although you are not modifying you can give whatever. So, it all stuffer box textured yarn will be in the range in which the modified stretch yarns are. And one of the reason is they actually do not have helical structure also all right.

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But after few minutes we will stop. Just talk something about it and then we will move further. Gear crimping somebody said well you are going to make a crimp so why cannot I use gears the intermeshing gears to produce the crimps. Exactly why do you want to do that? Stuffer box whether it making crimps why did do that

So, the argument was that here my frequency and amplitude are in my hand completely in control. Of course, you can heat the gears of course, you can heat the yarn and push it inside change will take place. After that before you put any tension you would cool it right in case we are talking about thermoplastic yarn right, simple.

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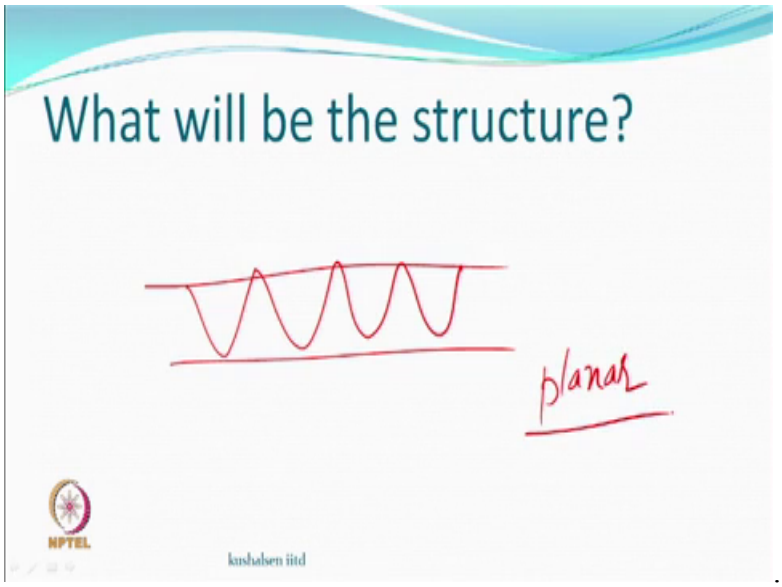

It's structure will be also planar, but same. So, we will stop here today and next time we will pick it up from here. And take if there are any ma other methods which can also be used to produce modified stretched yarns, all right. See you later.