False – twist texturing
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Lecture – 12
Influence of process parameters contd

So, influence of process parameters that we were discussing before. And we will continue with that till all the four parameter that we thought about; temperature, time, twist, and tension. So, what we had basically learnt is that the process parameter, that influence property textured yarn are for temperature, time, twist, and tension.

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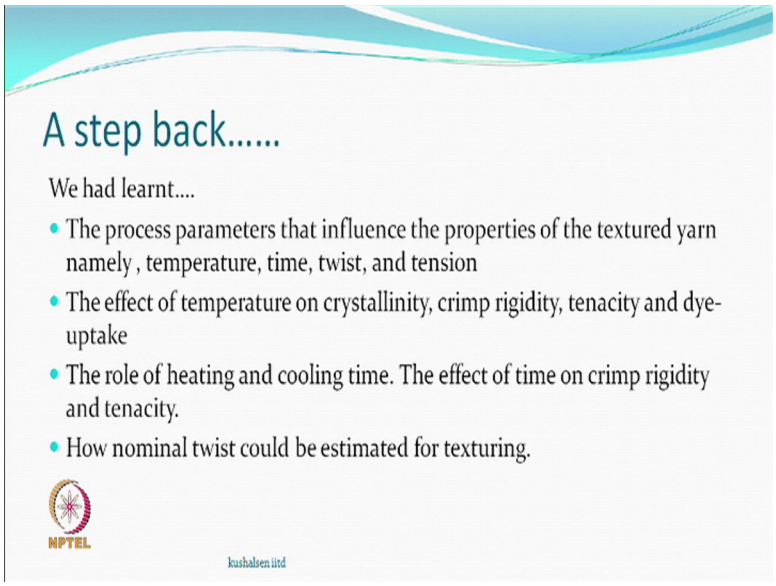

Effect of temperature on crystallinity crimp rigidity tenacity dye uptake we have seen. Role of heating and cooling time and the effect of time on crimp rigidity tenacity. And how one calculate a nominal twist just a thumb rule before you start optimizing as to how much twist is required. So, you work about twist continuing with that.

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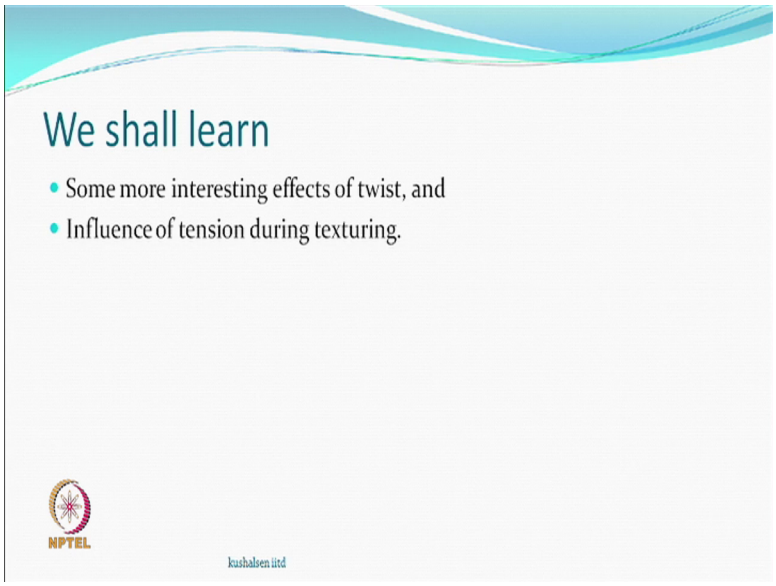

We will see what are the interesting effects that the twist, textured yarn twist of textured yarn will have an influence of the tension as well.

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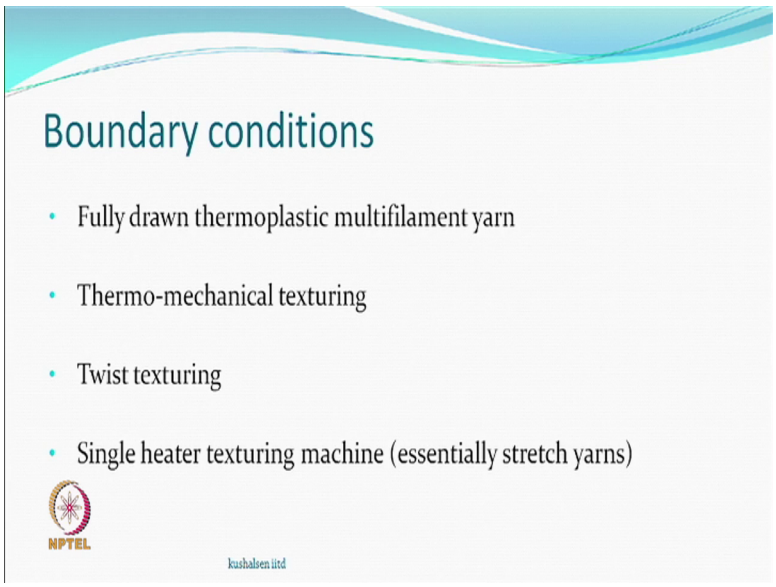

We still are working on fully drawn thermoplastic filament yarn. So, that is are boundary condition it is a single heated texturing machine and twist texturing.

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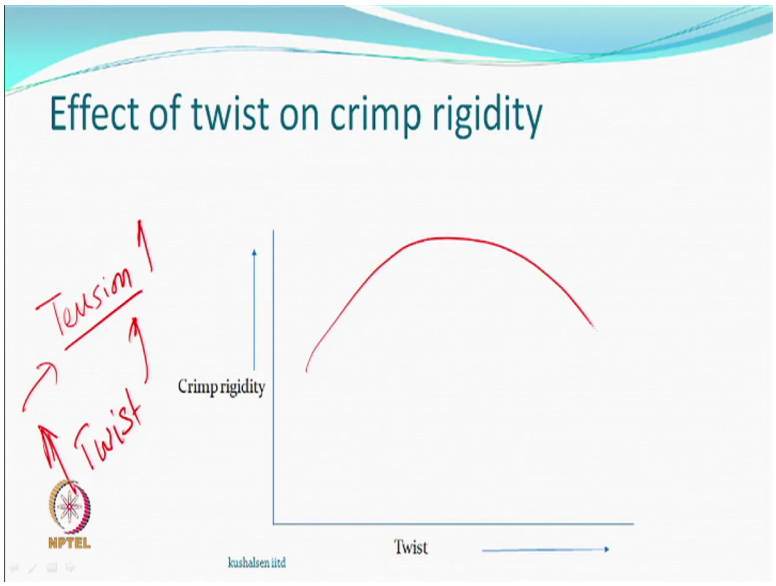

So, we had learnt about how much approximate twist should be given, which is relatively much higher than a normal twist compare to let us say spun yarn twist. So, the yarn can obviously, when you bring together two ends it is null.

So, the effect of twist on the crimp rigidity that is when you change the value of twist what happens? Any guesses that you would like to take here what would happen if level of the twist is changed.

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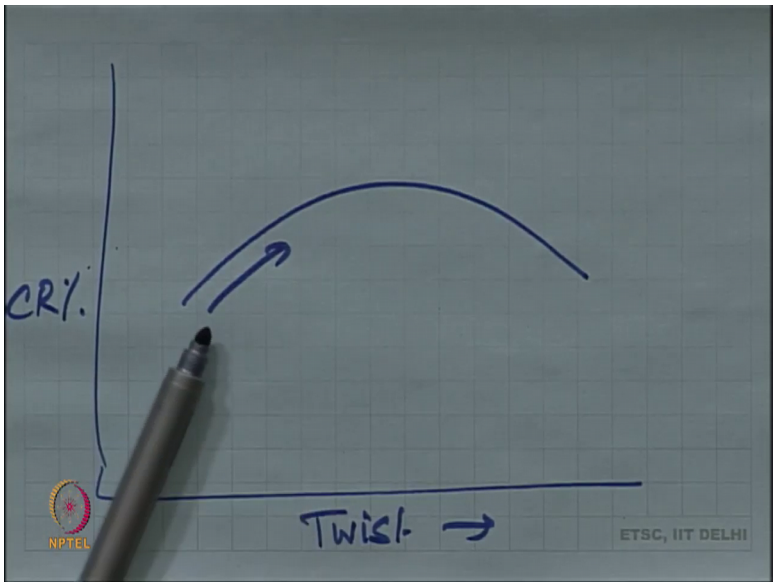

Student: (Refer Time: 02:28)

Yeah.

Student: After certain extent increase and then decrease.

Alright. So, this will increase and then decrease. Now why does it increase? And why does decrease that is what will be an interesting.

Student: (Refer Time: 02:41).

So, the increase is because the number of helices are increasing. And therefore, the initial increase is there. Why would it decrease?

Student: (Refer Time: 02:56).

Right. So, important thing that is just been brought out is that there is a question which gets associated with tension. If the take up and then the feed roller speeds are same and then you only increase the twist. So, when increase the twist tension increases means tension increases.

Now tension has a reverse effect compared anything else because this whole process of setting is relaxation process that the molecules are relaxing either to crystallize or to disorient. So, in all these cases relaxation takes place. In case we have a situation where tension increases because as we increase the twist.

Of course, the number of helices per unit length increase, but the tension in the yarn also increases which means relaxation is going to be hampered as of a setting is going to be hampered. And therefore, you will also have a situation where we would not be having proper setting. And crimp rigidity then can increase and can go down.

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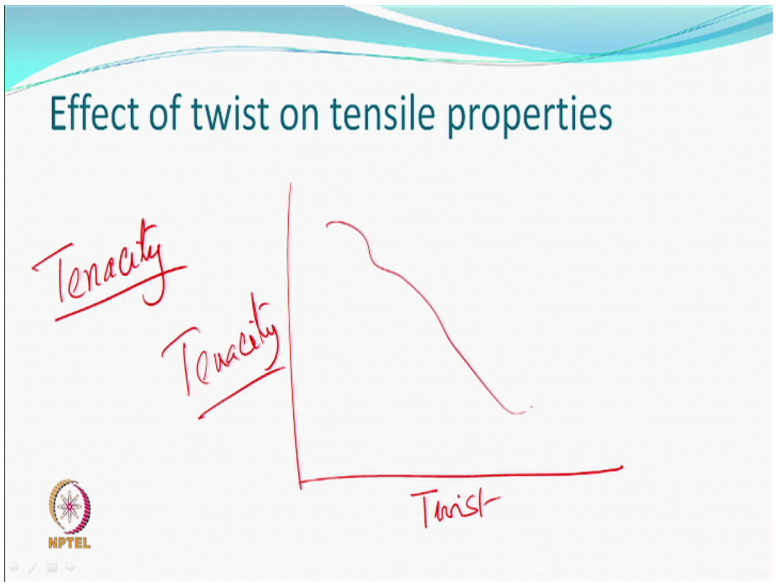

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So, what should be the effect of twist on tensile properties? Let us look at first the tenacity. What do expect what happen to the tenacity? Will the tenacity increase? Yes.

Student: First increase then decrease.

First increase then decrease.

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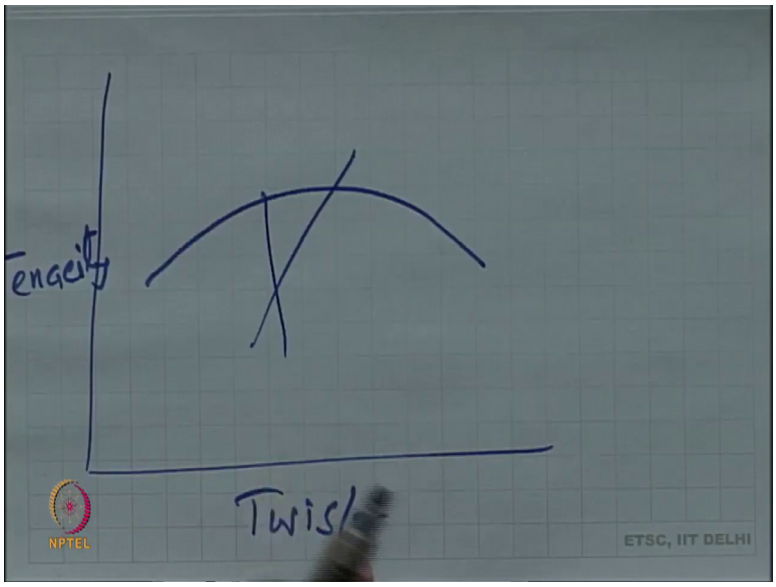

That means, whatever we are expecting in the case of crimp rigidity same kind of a curve you are expecting before we say it right or wrong would you like to just give an explanation why should it increase you do not agree? It should not increase why should not increase?

Student: Orientation will change orientation (Refer Time: 06:03) will help less.

Right, anyone else?

Student: As we are applying twist. So, there will be high tension that will hamper the disorientation processes.

And therefore?

Student: Therefore, first it should be increased.

So, why we argument is because there is tension and therefore, it would help to increase orientation. And therefore, tenacity may increase alright, but it is a bad argument, because the yarn is twisted.

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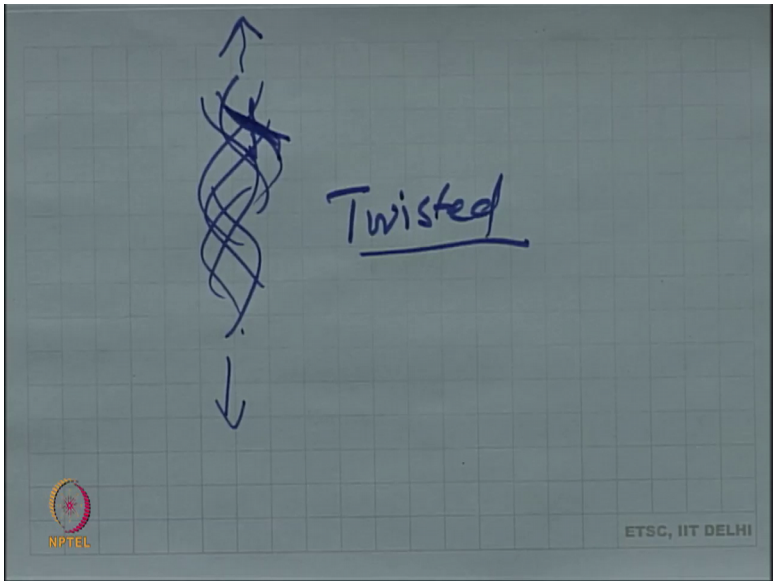

When you say you are increasing tension you are increasing the tension in a twisted yarn. What we mean is if the fiber is lying like this the tension is in this direction. And therefore, the orientation in the direction of the fiber axis is not going to be high. So, we started from the beginning itself texturing is a disorienting process. A large number of

elements are lying on a twisted yarn obliquely they are not obviously, parallel to the yarn axis is not parallel to fiber axis.

So, whatever you do increase the number of helices. It is only going to be from the orientation point of view it will be not good alright. And therefore, a good crimp rigidity actually means more better setting and there also somehow represents that the fiber orientation is not the same, it is actually going towards the negative side from the fiber point of view.

Because when will you measure how will you measure the tenacity, tenacity will be of a textured yarn when there is no twist when you will measuring tenacity of a textured yarn will be a parallel bundle while the setting was being done when they were not a parallel bundle. So, it is this situation is very different from fiber drawing. When you draw the fiber then the fiber filaments are parallel to each other and then you are pulling effect is; obviously, different.

In this case even if you pull you are only going to do a bad job as for the orientations concerned. And if tenacity is related to orientation then we cannot expect anything better. Like we said what about the you do you increase the temperature, the tenacity of the textured yarn will always be lower than the parent yarn. So, you will always get tenacity lower whatever you do. So, it will be reduced based on the environment the curve maybe different. But you can always say tenacity is likely to go down only alright.

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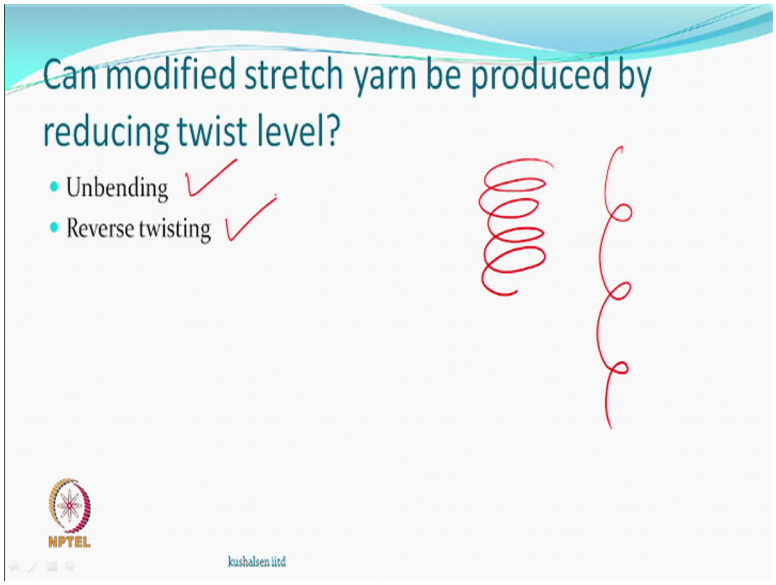

One somebody had asked a question when we are producing a modified stretch yarn by reducing the stretch. So, we first make a stretch yarn and then reheat under different condition. And we hope that stretch is going to be reduced. The question was why we cannot give less number of twists and get the same effect right.

So, why do we have to do two steps; first do setting or texturing at high twist level, then after texting you do a modified stress in secondary heater. So, why cannot we just reduce the stretch by reducing the twist alright. So, this was a common type of a solution to a problem it was not done because it is still not done because you actually do not produce a good yarn.

So, what statement was made that when you have more amount of twist in a first twisting machine for that matter. Then during un twisting there is more of unbending which takes place because the helixes are more flat. And so when the reverse twisting takes place there is a un bending of the coils takes place un bending ok.

But if the twist level is low let us say this is the twist level then when you do the so called un twisting, reverse twisting can take place. That means, all the filaments are twisted in the other direction rather than each filament getting un bend. So, the result that happens is that actually you have some real twist in the yarn.

So, all those twister use the same thing s is becoming z, but instead of each filament being opened and so that they remain individual the whole yarn as a bundle can get reverse twisted. So, in situations where less twist is given people saw that there is less un bending and more reverse twisting.

While our aim was whatever has happened I want to un bend the yarn. So, that they become again a twist free bundle of twist lively filaments. So, here the yarn becomes lively and not the filaments remaining the one which want to jump back to their own position. And so that is not a good idea and therefore, we are still continuing with two step process are you getting point.

So, when you have more twist more un bending takes place. When u have less twist then the chances of reverse twisting increase; that means, some real twist gets inserted in the yarn; that means, the bundle is no more a twist free bundle. So, that is one interesting

aspect come to the last parameter which can be controlled. And how do we control this? The speed of the feed roller and the take up roller can be changed.

And then you can change the tension in the yarn right which; obviously, has been twisted we assume that the twist is same the temperature optimized is same with time that is speed is also same the only the tension can be changed. So, the final output is keeping the same some tension can be changed. So, there is a control. So, you have a control whatever tension you want to learn and something you have already talked about tension in the section that we are talking about the twist.

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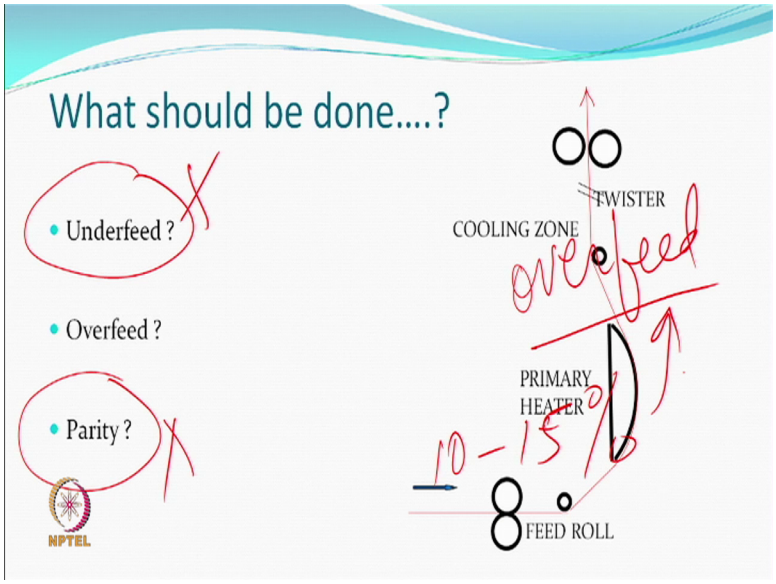

So, once we have understood the effect of tension during texturing what should we do? We have a control on the feed roller and take up roller what we do underfeed overfeed or run at parity; that means, the speeds are same.

Student: Overfeed.

Overfeed why do we overfeed? Why do we overfeed?

Student: Soft package.

Soft package; that means, you definitely would not first do underfeed because you are only going to be increasing tension which is not good for setting purpose. In the parity situation also there can be tension normally if you run a yarn the speed of the two rollers

is same what you expect to the tension? You are feeding the same amount of yarn and collecting the same amount of yarn. So, between the thing how much tension could be there?

Student: Which we give in the starting.

Alright so whatever tension that you have kept it in the beginning that is one which can continue if that is what we looking at. But in this case it is a thermoplastic yarn and it is being heated. And heating means you are allowing molecular relaxation.

So, stress in the yarn generates because the molecule want to relax and you are not allowing it to relax and so stress generates. So, two thing can happen because we know thermoplastic yarn shrink on heating. And if we do not allow shrinkage then the stress will build up because of thermal relaxation. And that means, if you do at parity you will have large amount of tension which anyway is not good.

So, we reject this we reject this so overfeed the only thing left. So, we control the tension by controlling overfeed. So, about 10 to 15 percent overfeed can be given does it mean that the yarn will be totally relaxed. If yarn is totally relaxed you can think you are twisting the yarn at high speed it keep jumping off from one place to other. It is suppose to traverse it is path on the surface of heater if there is no tension it will go away from the surface heater particularly when you are rotating at a faster speed.

Therefore to run the yarn while you are twisting minimum tension is required so, that it remains always in contact with the heater. So, what it also implies is that even at 10 to 15 percent overfeed you may still be having the yarn under tension. You would like to run it at a 0 tension but you will not be able to run at a 0 tension because then the yarn will jump off because it is not something which is just passing over a heater it is being twisted at high a speed when it is passing over twister alright.

And therefore, there will be tension certain minimum amount attention is required to operate the machine itself. But you like to keep it as low as possible. So, that the setting is better higher tension is not good it is not that yarn is going to break, but setting is going to be affected right. So, anyway this is was just a diagram of the machine line diagram which; obviously, you cannot see it now that I have already written something on it.

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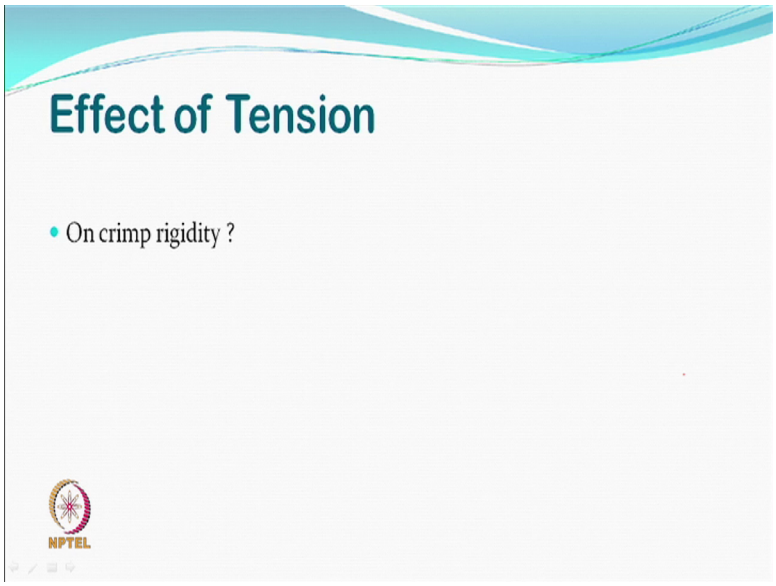

So, effect of tension on crimp rigidity will be the crimp rigidity will reduce if it gives the tension and this is what we discussed before. And that is why you would like certain amount of overfeed to be given ok. Within that also you can change the overfeed and get the value of crimp rigidity right keep changing the over feed. Therefore, you will get keep changing tension and you can see effect of this on the crimp rigidity. So, it is like a good project which you can do.

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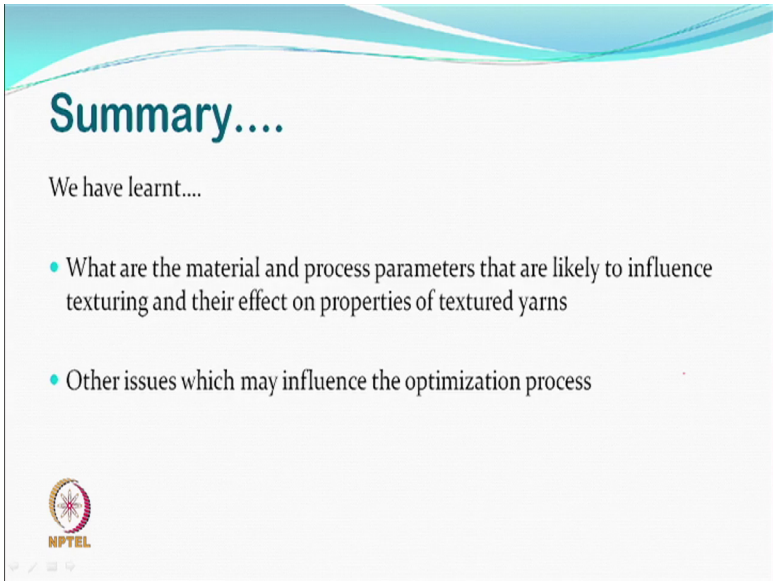

So, we summarize and what we are doing is that we have seen that there are various material and process parameters that influence the texturing. And we have also seen some of their effects on the property of textured yarns whether it is the change of material and the specific heat and what not or the process parameters like temperature time twist in tension. And any other thing related like dying effect on dying and structure relationship also we try to understand.

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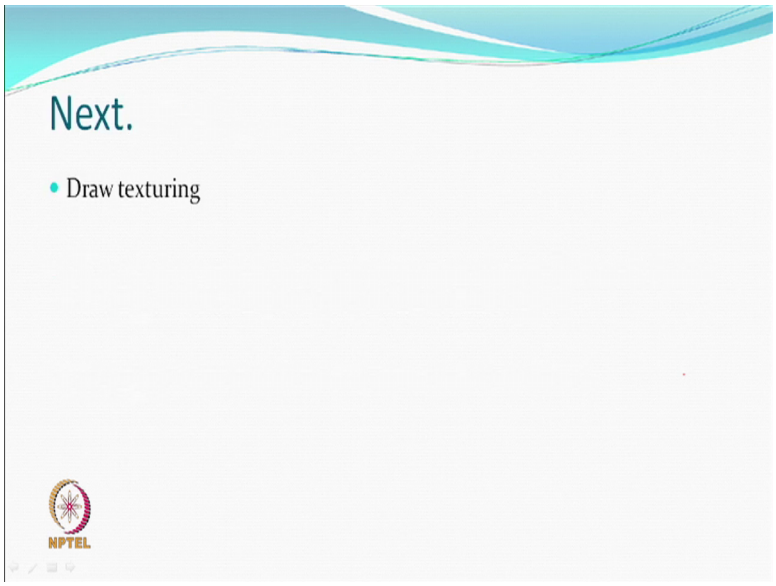

So, we will in the next class change the topic. As of now we had the boundary condition where we were using only fully drawn yarns. And now we will go to another type of a texting which is called draw texturing; where it may not be a fully drawn yarn yeah that you want to handle, you will like to handle a different type of yarn which can be drawn on the texting machine itself. So, here stop for today.