Science and Technology of Weft and Warp Knitting
Prof. Dr. Bipin Kumar
Department of Textile Technology
Indian Institute of Technology - Delhi

Module - 6
Lecture - 27
Knitting Calculation - Production (Flat)

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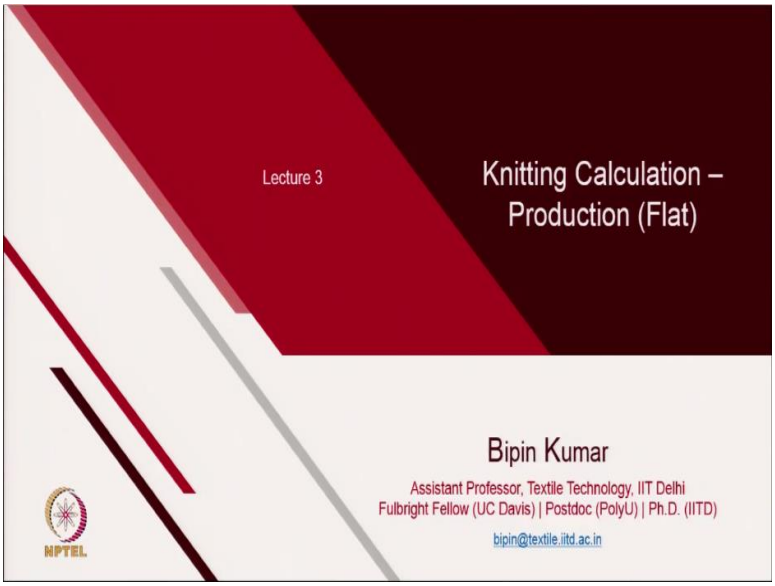

Welcome participants. Now, we are moving to lecture number 3. This is related to production, but mostly on a flat knitting machines.

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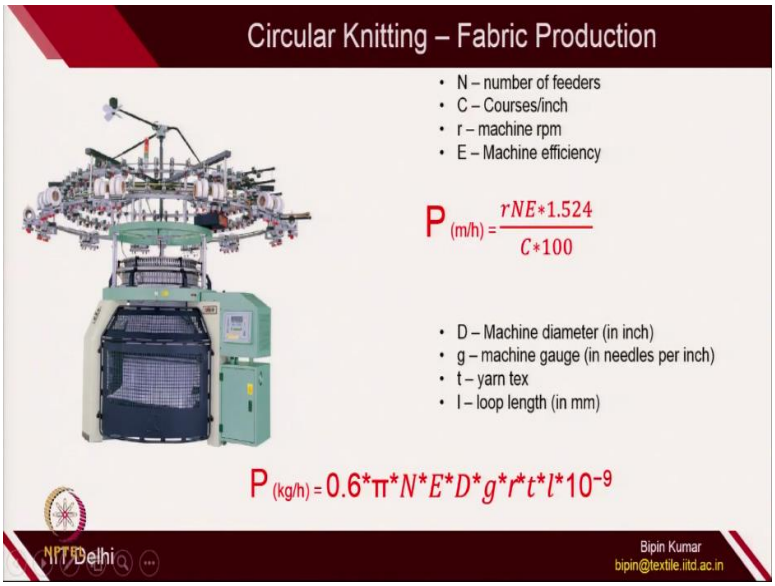

So, in the last lecture, you have seen the production on circular knitting machines. We derived 2 formulas, production in meter per hour and production in kg per hour. So, you do

not have to remember these formulas. If you know the steps, you can simply derive these useful formulas. So, these are very much useful in finding the production capacity of the machine, if you know certain variables related to machines. So, in case of circular, you have seen, mostly the cylinder is rotating. So, we have the rpm as one of the machine variables. But now, let's see the production in flat knitting.

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So, in flat knitting, you have seen the carrier do not rotates around the cylinder because you have the flat bed. So, the carrier actually traverse from left to right or right to the left.

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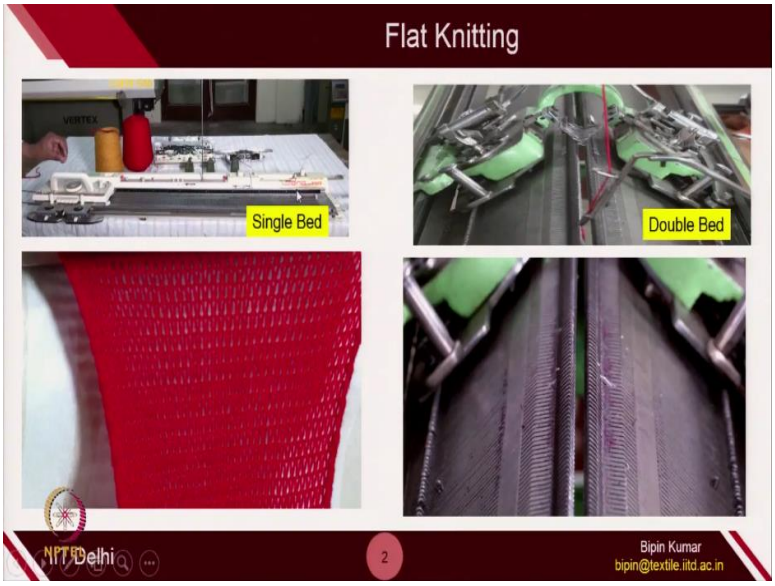

So here, 2 machines we have already seen in previous weeks, single bed machine and double bed machine. **(Video Starts: 01:33)** So, this is the double bed machines where there are 2 carriers for 2 beds. And they are just moving from one side to other side. **(Video Ends:**

01:40) (Video Starts: 01:41) If you see single bed machines, it is moving from left to right or right to left. So here, basically it is not rotating; rather, it is just traversing from left to right or right to left. **(Video Ends: 01:52)**

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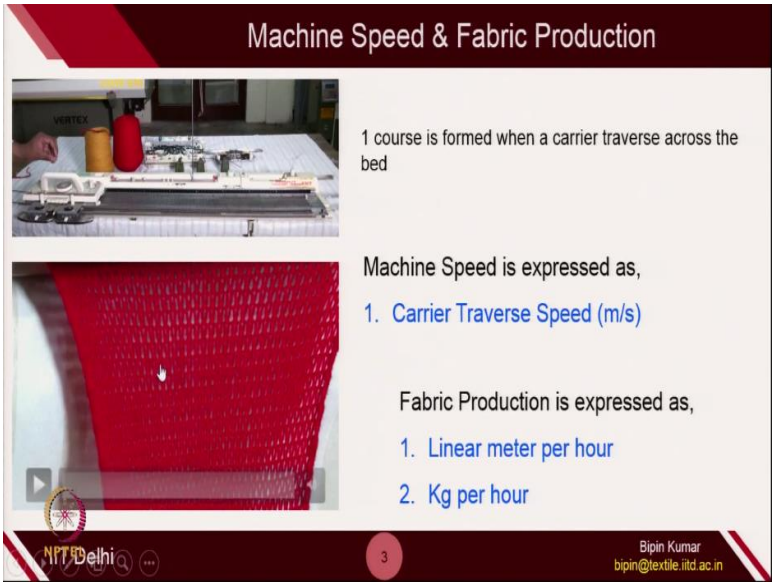

So, definitely the variables will changed for fabric production on flat knitting machine. So, in usually in flat knitting machines; **(Video Starts: 02:02) (Video Ends: 02:06)** so, if you see the flat knitting machines, especially speed is expressed in carrier traverse speed. Because, you know this is the carrier which traverse on the machine from left to right and right to left. So, we need to be, we should know the carrier traverse speed. And then we can express the fabric production similar to circular machine as a linear meter per hour or kg per hour.

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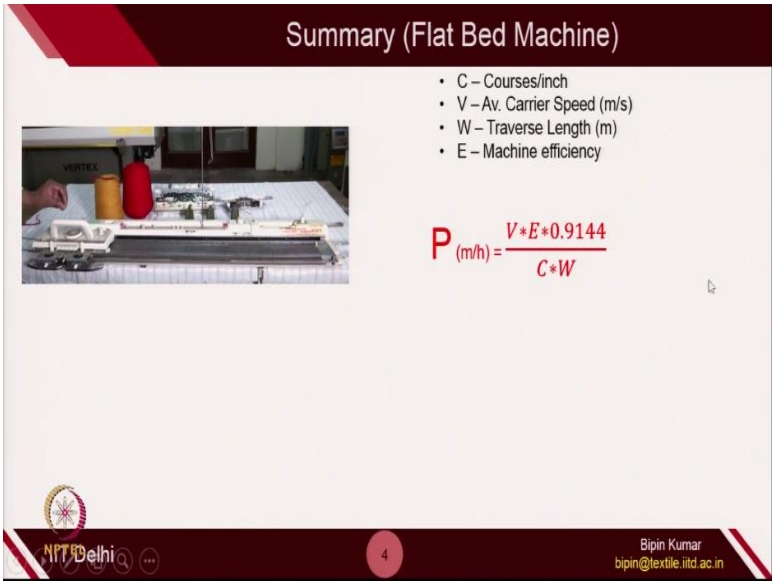

The derivations, you can find it here. Production on a flat bed machines is equals to velocity of the carrier; E is the efficiency; C is the courses per inch; and W is the traverse length. It means, how much the carrier traverse on this bed. So, this is the formula. Let's derive this formulas. It is a very simple steps. And then, you will able to figure it out, how this formula has come. So, let's see the derivation.

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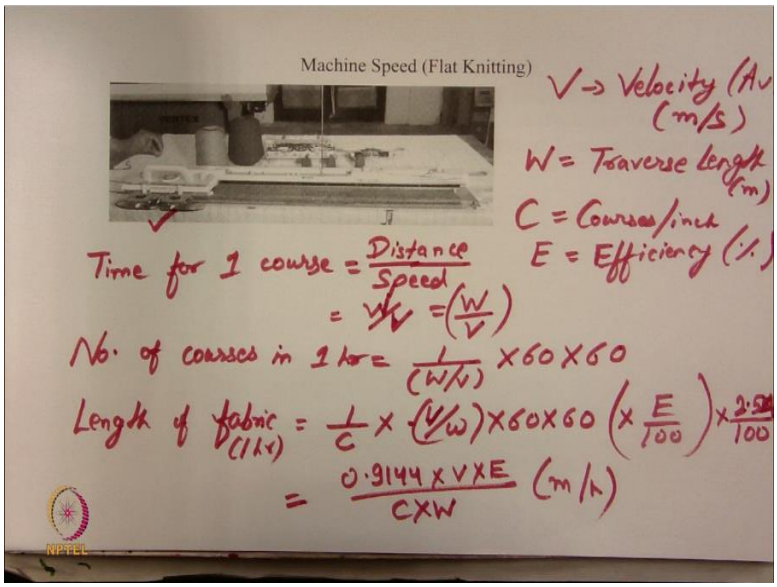

So, this is your flat machine. So, this is the carrier. If you see, this is the carrier. So, first thing is, first variable is the velocity or speed of the carrier in meter per second. So, this is the velocity of the carrier through which it is moving on this bed. So, we have taken the average speed, because you have seen the velocity will start from 0, then it will reach somewhere at the higher highest point, somewhere in the middle of the bed.

And then, it will again goes down to 0. So, that's why we have to take the average speed. The other variables; so, this is the average speed; please remember. The other variable is traverse length. So, we should be knowing, because the bed is almost 1 to 2 meter of length. So, sometimes you might not be using the entire length of the bed. So, you might be using only selected portion of the bed, by counting the number of needles.

So, W is the traverse length in meter. And other 2 variables; once the fabric is produced, you can easily count out the courses per inch and E is the efficiency. For example, if the worker is taking some break during the production; so, efficiency. So, once you have these 4 variables, you can find out the production. So, you know the velocity of this carrier on this bed. You know the traverse length; what is the selected portion of the needles on the bed.

You can find out that length. So, the time taken, time for 1 course. You know the distance, you know the speed. So, simply you can find out the; so **distance/speed**. So, if the carrier travel certain distance on this bed from left side to right side, it will just made 1 course. So, to make 1 course, you know the distance consumed on the bed and you know the speed of the carrier. So, you can simply **W/V**. Okay.

So, W is the width; W by; and V is the velocity. So, number of courses, you know the; for 1 courses, you know the time. So, number of courses in 1 hour you can find out; number of courses in 1 hour. You can simply find out, 1 course is taking this much time. So, if you take the **1/ (W/V)**. This is the number of courses made by 1 second; **1*60*60/ (W/V)**.

60 second, 1 minute; and then 60 into 1 hour; 60 minute into 1 hour. So, this is the number of courses in 1 hour. Because in 1 hour there are 3600 seconds. So, in 1 second you are making **1/ (W/V)** courses. So, in 3600 seconds, you are making this much courses. So, you know the number of courses. Now, you can simply find the length of the fabric.

Length of fabric =course spacing*number of courses.

So, course spacing is nothing but **1/C * (V / W) 60*60.** So, these are the number of courses. And this is the course spacing, **distance between 2 courses= 1/C.** So, the length of fabric in 1 hour; it is produced is this much. And since it is running only for certain percentage of the time; so, you can simply multiply efficiency here. So, into **E/100**. So, this is just to make sure the downtime, if the labor is not working.

Length of fabric/hr =(1/C)*(V/W)*60*60*(E/100) inch

If you, if the hand is tired, then you might rest for some time. So, this is overall formulas. So, if you will just rearrange, you can find out. So, here if you see, this is, this course is in inch. So, you can, it is better you can convert this into meter. So, if you convert this into meter, because this is in inch; so **Length of fabric/hr =(1/C)*(V/W)*60*60*(E/100) *2.54/100**. So, in totality, if you will just take all, arrange and remove the zeros from the numerator and denominator; so, you will get **Length of fabric = 0.9144 * V * E/ (C * W) meter / hour**.

So, this is the formula for the production of fabric in 1 hour. So, this is in meter, meter per hour. So, we have seen the derivations looks very simple. Even if you don't remember the formula, if you remember the steps, if you have understood the concepts, you can easily find

out the production. So, let's have a very simple example and then we will finish this particular lecture. So, the formula you have already seen, the formula production per hour. So, this is the question. Let's see the question.

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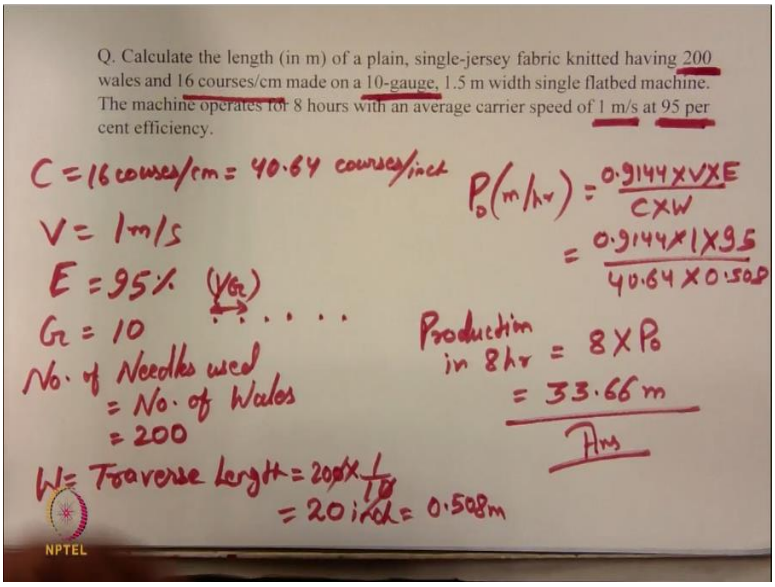

So, calculate the length of a plain single jersey fabric knitted, having 200 wales and 16 courses per centimeter made on a 10 gauge machine. 1.5 meter width single flat bed machine. The machine operates for 8 hours with an average speed of 1 meter per second at 95% efficiency. So, the machine is running for 8 hours. The carrier speed is 1 meter per second; efficiency is 95%. And if you see the course per inch, this is 16 courses per centimeter.

So, the course per inch is 16 courses per centimeter. You can convert this into inch, because every time we are using course per inch. So, this will be 14.64 courses per inch. Okay. So, you can say, you can convert centimeter into inch. You can get the value of C in courses per inch. **V = 1 meter/second**. If you see, velocity is 1 meter per second; efficiency is 95%. You have seen efficiency as 95%.

And the gauge; gauge of the machine is 10. Because you have seen here, the main gauge of the machine is 10. The other interesting thing you can understand here is, the fabric is having 200 wales. So, each needle is making 1 wale. So**, number of needles used=number of wales**. And how many wales are there? 200; so 200. So, it means, on the machine, you are using only 200 needles.

So, you can find out the distance W, which is **traverse length =200 * distance between 2 needles**. So, you have the needles. So, **distance between 2 needles = 1/G**. If you remember machine pitch, **distance between 2 needles = 1/G**. **= 1/10**. So, this is 20 inch. And you can convert this in inch into meter. This is equals to 0.508 meter. And now you can simply use the formula, because you want for 8 hours.

So, production meter per hour, the formula was, we have already calculated.**9144*V*E/(C* W**). So, please make sure the units are always, like C is in courses per inch; so, 0.9144. Velocity was 1; efficiency 95; and courses per inch was 40.64; and width of the machine was 0.508. This is for 1 hour. So, let's suppose, this is for **Po**. And production in 8 hour; you can simply multiply **8*Po**.

So, you can find out this. So, **8*Po**. Eventually, you will find out, this will **= 33.66 meter**. So, this is the answer. So, with this, like if you have the machine variables and some basic parameters from the fabric, you would be able to find the production capacity of the machine. So, with this, we are ending this lecture. So, again, so, this is the formula you have to, you might remember or otherwise if you understood the concept, you do not even want to remember this type of formulas.

So, in the next class, we will start a calculation related to fabric structure, like GSM, course width, the fabric length, shrinkage, tightness factors. So, all related to fabrics, we will be covering in the next lecture. Thank you. Thank you very much for listening.