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

Module - 4
Lecture - 19
Knitting Notations

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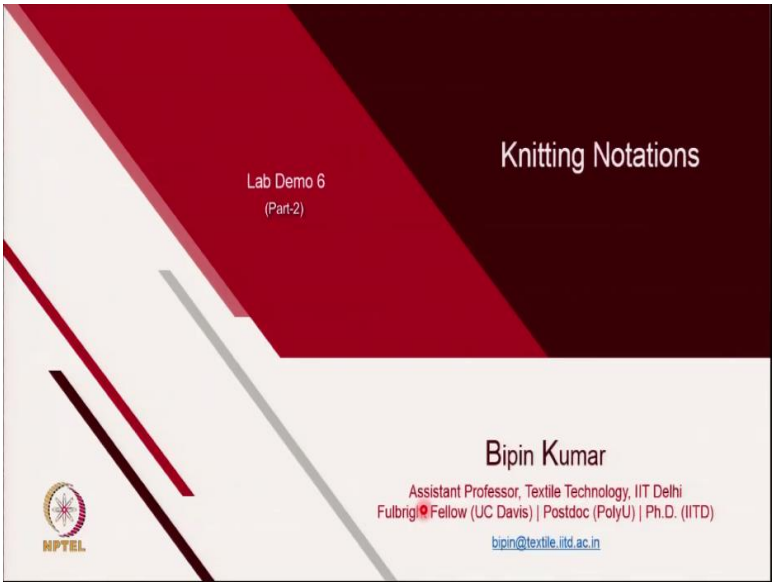

Welcome participants. In this particular lecture also, we will be continuing the knitting notation for complicated fabric structure. Last lecture, you have seen how we can go for box, point and bar diagram for simple fabric structure. But in this particular lecture, I am going to show you more complicated structure where the yarn movement is highly complicated. And how if you follow the yarn path, you can represent those fabric structure with these type of notations.

So, let's see what we are going to cover especially **(Video Starts: 00:57)** today. We are going to cover very different knitted structures which looks even more complicated. So, some of these examples are like this. So, we are going to cover these type of fabric structures, where you can see the yarn path are highly complicated. So, some of these structures, we are going to learn how we can note these type of structures.

So, let's start with the simplest one, this particular structure. So, if you see these 2 particular structure, you can easily find there are loop, tuck and float. So, how we are going to represent

these structures when multiple number of needles are involved in tuck and float formations. So, in the last lecture you have seen 2 examples where there were just one float that was created by needle.

In some fabric structure, the number of needles which might be making floats maybe more than 1, 2, 3. For example, herein, this fabric structure 4 float are being made by 4 needles. Now, we are going to understand how, what are those 4 needles which are making float and how they are making. So, let's start with this. So, the approach remains similar. We need to first see how many courses you can identify and how many yarn movements you can follow.

So, if you see this particular course, the white one, if you see this one, the white one; in this particular course, all are making loops. Okay. So, this is our first course, because you can follow the path of the yarn. Okay. Now, let's see the second course. So, second course is this black one. Okay. So, this is the black yarn which is shown. So, if you follow the path, it moves like this.

It first make loop; then float; then again loop. So, 2 courses you can easily see. If you follow the third course, we are not sure what it is making. So, I am skipping this particular third course. Let's focus to note down these 2 courses. So, again, for the point notations, we have to first make sure whether this fabric is a single jersey fabric or double jersey fabrics. So, if you see the movement of needles in a particular course.

So, if you see this particular needle, it is making on the technical back side. This particular bigger loop, also it is making on the technical back side. This also, technical back side. So, all needles are actually participating in the loop formation on the technical back sides. So naturally, this fabric is a single jersey fabric and it has been created by single bed. So, we just need 1 row of needle.

And how many columns you can count? So, this is first column, second column, third column, fourth column, fifth column, sixth column. So, 6 needles has been participated. So, you can take 6 needles: 1, 2, 3, 4, 5 and 6. Okay. This is your first course. So, first course, 6 needle has been participated. In the second course also, all those 6 needles has been participated. So, for the second course, we are again showing 6 needle.

So, this is for second course. Okay. Now, let's start giving the notation. So, if you see the first course, it is technical back side. This bigger held loop is also technical back side. This is also technical back side. This all are technical back side. So, how do we represent technical back side? Something like this. So, if you see the loop; technical back side, we represent like this. So, we can simply make all technical back loops in the first course. Okay.

And these 2 technical back loops are connected. So, we have joined the same yarn. And this part is actually nothing but the sinker which is connecting 2 loops along the course. Now, go to the second one, which is most interesting one. So, if you see the first loop, it is technical back loop, no doubt. So, you have represented, this is technical back loop, the black one. But, if you go in the second column, in this column, this particular yarn is having no intermeshing points.

So, all 4 intermeshing points at foot position and head position for this particular position of the loop is missing. So, that's why, this yarn is in a straight configuration. So, this is nothing but a float. And how do we represent float on the technical back side of the fabric? So, if you see the float on the technical back side, we give a straight bar below the needle point. So, we can show like this. Okay.

If you see this third needle, again, all are making float. So, 1, 2, 3 and 4. So, these all 4 needles are making float. And since these floats are connected with each other, so you can simply connect all the lines. So, these are 4 floats. Now, come to the last loop of sixth column in the second course. You see this particular loop; this is technical back side. So, you can simply make technical back side and you can connect with the yarn.

So, this is how you can represent this particular fabric with point notation. Okay. Now, if you go for box notation, once any one of the notation is okay, then you can simply follow the other notations. So, in box notation, since it has 2 courses, so you need 2 rows and you need 6 columns: 1, 2, 3, 4, 5 and 6. So, 1 and 2; these are the 2 courses; and these are the 6 columns. In the first course, you have all technical back loops; so, all 0, 0, 0, 0 and 0.

So, all technical back loops. In the second course, you have technical back loop in the first column, then all float. So, how do we represent float in technical back side? So, in technical back side, we represent float by a blank box. So, we keep all these 4 boxes blank, because

they are representing floats. And float means no intermeshing points. So, that's why it remains blank.

And then, in the sixth column, you are again making loop. Okay. So, this is the box notation. Okay. Now, if you go for bar notation, you can simply have the bar notations in the similar fashions. So, you first need 6 needles for 2 courses. So, this is first course, this is second course. And how do we represent back loop in the bar position? Something like this. So, we represent all 6 technical back loop in bar notation.

So, this is your bar notations. If you go for second course, again, the first one is technical back. So, you can see technical back, technical back. And how do we represent in the bar notations? The technical back is represented by a straight line which is placed below the needle. So, this is the needle and you place simple a straight line. So, you can simply put a straight line. So, you can simply put like this.

And then, again loop, because you have the technical back loop in the last column. So, this is how you represent point, box and bar diagrams. So, here you can see, there are 4 needles consecutively; they are making float. Okay. So, this diagram is some little bit different. Now, let's move to the next one which is similar to float, where multiple needles are making many floats.

So, let's see this particular fabric. So, if you see this fabric, which we just completed; if you see this fabric and this fabric, ideally they are different in many sense. So, if you see the straight segment, it is on the leg side. But here, if you see the straight segment, it is towards the head side of the bottom loops. Okay. So, if you see this one, straight segment of the below course. But, if you see here, the straight segment is towards the head of the below loops.

So naturally, it means, at these points, the needles are holding 2 loops. So, if you remember in tuck; so, in tuck clearing does not happen, so old loop does not clear and it catches the yarn. So, these 4 needles at these locations actually catches the yarn. So, that's why these all 4 needles are making tuck, which is different from this one. Okay. So, how do we represent this particular fabric?

So, first you count number of courses. So, this is the first course where you can follow the path, the grey yarn. If you see this, this is the first course. Then the black one, this is the black one, which is little bit complicated. And then, this third course, which is also visible; so, this is your third course. Okay. So, you have third course. And how many columns you can count? So, 1, 2, 3, 4, 5 and 6; 6 columns.

So, naturally you need 6 needles and 3 courses for. So, 1, 2, 3, 4, 5, 6; this is for first course. Then 1, 2, 3, 4, 5, 6; second course. 1, 2, 3, 4, 5, 6; third course. Why we are using one set of needles? If you carefully see all the loops; so, this is also technical back side. The second needle is also making technical back side. Third needles is also making technical back side. So, all loops, all needles in this particular fabric, they are towards the back side.

So, that's why, it is made by single bed machine. So, this is also a single jersey fabric. And you have 3 courses which is visible here, and it is made by 6 needles. Okay. So, let's start filling the loops and stitches as per the diagram. So, if you follow the first course, all are technical back side; so, that's why you can simply put technical back side. So, these are the 6 loops in technical back side in the first course.

Now, if you follow the second course, first one is technical back and the last one is technical back. But if you see the 4 needles, these 4 needles are catching the yarn at the head position of the below loops. So, this is only possible when it is having tuck. And you can see, this is, the tuck is having 2 intermeshing points missing. But unfortunately, the second consecutive needles next to the second needle, the needle is also making tuck.

Because of that, it, this particular tuck loop is losing 3 intermeshing points. Okay. There is only 1 intermeshing here at the head position. If you see the tuck here, since for this particular needle, the left needle and right needle are also making tuck. Because of that, they would not be able to create any intermeshing point. So, it looks like float, but since the yarn segment is present on the head part of the old loop, it means, ideally on the machines, this needle has catched the yarn before clearing the old loop.

So naturally, this is the process of tuck. So, we had to represent this as a tuck. Again, if you go for the third, this yarn is cached with the old loop. So, that's why, this is also tuck. And the fourth one is also tuck. So, how do we represent tuck? So, for representing tuck, if you

remember technical back side, the tuck is represented by like this. So, we can represent like this.

And we can simply connect these loops. All tuck loops are connected. So, if you carefully see, all the yarns are on the technical back side of these particular needles. So, these tucks, all the yarns on are on the same side. So naturally, when the fabric will relax, these all tucks will become a straight. So, in some of the books, you might have seen, these might have represented by something like this; straight segments.

Because, if you see this one in the relaxed condition, the fabric will shrink. And eventually, these segment of yarn will become a straight. So, all segments will become a straight and these all segments are towards the same side of the needles. So, that's why they become straight. This is again the tuck position. So, if we carefully see; so, the yarn is going from one side and then it is moving towards the other side of the needle.

So, here also, from one side is moving towards the other side of the needle. And consecutively, it is making 4 tuck; and then it is going back on the other side to make technical back loop. So, either you represent the second course this way or this way, it remains similar. Now, go to the third one. Third one is again very similar; technical back, all are technical back. So, you can simply make like this. Okay.

So, this is your point notation. Now, let's go for the box notation. Box is even very simple. So, if you can simply make box where you have 3 courses and you have 6 columns: 1, 2, 3, 4, 5 and 6. In the first course, you have all technical back. So, you can put 0, 0, 0, 0 and 0. Second row, you have 0. Then 4 tuck. And how do we represent tuck in technical back? By dot. So, if you see tuck on technical back side is represented by dot in a box.

So, 4 dots representing 4 tucks. So, these are 4 tucks represented by 4 dots. Then 0. And then, on the third course, all are technical back; so, you can simply put 6 zero. So, this is your box diagram. And now, if you go for point diagram, again you need 6 bars for 3 courses; first, second and third. In the first course, it is making technical back. So, this is how technical back is represented.

So, this is how you make 6 technical back in the first course. Now, if you go for the second one, the first and second are making technical back. And then, the 4 needles in the second course are making tuck. So, how do we represent tuck? Something like this. Okay. And after that, in the third course, again it is making 6 technical back. So, this is bar notation. Second course, again if you see, 4 tucks are in a consecutive sequence.

So naturally, the yarn in reality will not be always in zig zag form. It will remain in a straight form. So, you can represent these second course by straight segments as well. So, you can represent like this; something like this. So, either you say represent the second course, like this or like this, they all are similar indications. So, this is how, you can see. Although, it has straight segments here and here also, but this indicates the float, this indicates that tuck, as per the engagement of needles on the machines.

Otherwise, these 2 fabrics will never be the same. It will always be different, because the nature of the formation of these fabrics on the machine. So, you have to be extremely careful and understand the actual sequence, how they are being formed on the machines. And because of that, so, if you understand the machine part, then only you will be able to clearly express the notation in a right way.

So, we have done with this. Now, let's go for double jersey fabrics, because, we so far, we have only completed with single jersey. Now, let's go for the double jersey, the simple one. How do we identify whether a particular fabric is a double jersey or single jersey by this particular diagram? So, to make a double jersey fabrics, we have already defined that it needs 2 beds.

So, whenever we are operating the fabric with 2 beds, so some loops will be technical front and some loops will be technical back. So, you have to see, on this fabric, whether you can see any technical back or front loops, simultaneously on the same surface. So, if you see this particular loop, it is technical back and the next loop is on the front side. So, this is technical front.

So, this is technical back; this is technical front; then, this is technical back. If you go below, technical back, technical back. If you go here, technical back. This one, technical front. Then, this one, technical back. So naturally, this fabric is having technical back and front on the

same surface. So, this is definitely cannot be created on a single bed machine. So, because of that, we need 2 bed arrangement for representing this fabric.

So, how do we represent needles for 2 bed. So, for representing needles for 2 beds, you have front bed needles and then you have back bed needles. So, the below set of needles is showing front bed and upper set of the needles showing back bed. So, this is how we represented the gating for double bed in case of rib fabrics. Okay. So naturally, this fabric must be having 2 sets of needles.

So, now let's count how many needles has been used on each of these beds. So, first let's see how many courses are there. So, this is the courses number, which is shown here. So, in the first course, you can see all are technical back side. And which bed make technical back side? So, the upper set of the needles. So, these 2 needles are making technical back side; so, because here there is 2 loops.

And all are technical back side. Now, if you go for the second course, again, this loop is technical back side and the next loop is also technical back side. So, again these 2 needles, and the old loop is just below this. So again, same 2 needles from the back bed has to be used. Now, if you go for the third course, the black one is technical back side. The old loop is just below this.

The left most loop, this loop is also technical back side. Okay. But, now you see, there is a new loop has been created. We need to understand how these new loops has come, which bed is responsible. So, if you carefully see the leg; so, leg is coming out. So naturally, in the third course, one of the needle from front bed has to be engaged, because the nature of loop is on the front side.

So, till 2 course, only back bed was operating. But in the third course, because of this loop, which is technical front in the nature; so, one of the needle from front bed has to be used. So, now from the third course, there is 3 needles is participating, and 1 needle is from technical front side. Now, let's go for the fourth course. This loop is technical back. Again, if you see this loop, 4 intermeshing points, but technical front.

And the third loop, this is technical back. So, 2 technical back, 1 technical front. So, 2 needles from the back bed, 1 needle from the front bed. In the fifth course also, 2 needles from the back bed, 1 needle from the front course. So, 5 courses is there. And in the first course, 2 needle from the back bed; second course, 2 needles from the back bed. And next 3 courses, we are having 1 needles from the front bed, taking part.

So, first, let's create 5 set of front and back bed needles. So, we can have as many needles depending on the number of columns. Since here, we have just 2 needles from the back bed, but for the simplicity, to representing the back and front beds, I am representing more number of needles towards the front bed and back bed side. But, while making the loops, I will be using only few needles from each of these beds.

Now, let's go for the third course. Now, let's go for fourth course. Now, let's go for fifth course. And the placement of back and front bed, because the needles are not facing each other. So, that's why, they are replaced or they are displaced laterally by half pitch. So, you can see, this needle and this needle, they are not in the same vertical straight line. So, the back bed is actually shifted from the front bed by half pitch distance.

This is, you represented the 5 course of front bed and back bed. Now, we start representing this particular needle. So, I can pick any 2 needles of the front bed or back bed. So, let's, I am picking 2 needles of the back bed, somewhere here. We can also pick here, but it depends on the users. So, either you can start from the left or you can start from the right or you can start anywhere in the between.

So, the first course, 2 loops from the back bed, because these 2 loops are on the back side. So, any 2 needles; so, let's make 2 loops on the back side. So, this is the 2 loops on the back side. So, 2 needles from the back bed. So, back bed; and in case of V-bed, we know front and back notations. If you have cylinder and dial; so, the front bed is actually represented by cylinder and the back bed is represented by dial.

So, in case of double bed circular machines. Now, if you go for the second course, again, these 2 loops, if you see these 2 loops are again being formed on the same bed which is the back bed, because they are technical back side. So, this needle is again creating this loop. So,

okay; and this needle which created this loop and now creating this loop. So, 2 ring. Now, let's see the third course.

Again, if you see this loop, this is technical back side. And the left loop in the third course, this is again technical back side. So, this and this. So, again 2 needles, they created 2 technical back loops. But, when these 2 back loops are not connected; so, we cannot connect these. Rather, in between 2 loops, there is 1 front loops is coming. Because now, one of the needle, especially this needle, is now participating.

So, you can see the yarn. Yarn is now going in the front bed, because the nature of the leg which is moving; the loop is moving on the front side of the old loop. So, this is the old loop. So, you can see the nature of leg is towards the front. On the front side, leg is visible. So, this is visible on the front side. So, that's why, this particular loop has to be created using front bed.

So, one of the needle has to be used. Now, the question here is, if you carefully see this particular loop, 2 intermeshing points is missing. But the loop at the, this particular loop, there is no old loop on the front bed. So, 2 of the intermeshing points for this particular front loop is missing, because there is no old loop at the bottom, on this particular needle. So, naturally, if you try to go by the definitions, it has only 2 intermeshing points.

And this is the first loop which we created on the front bed. Whenever the needle is pulling the yarn first time, it will only create the needle segment. It will not create the other 2 intermeshing points, because there is no old loop. So, this loop is missing. So, because of that, there is only 2 intermeshing points. So, although, if you follow the yarn movement, it looks like tuck, but since it is the first course or first loop on the front needle 2 intermeshing points are missing.

So, this is not a tuck as per the definitions, because there is 2, no old loop is holding on the needle. So, this is just, there is 1 head. So, because of that, this is again a loop. And this is semi-loop, because 2 intermeshing points of the loop is missing. So, if you go lecture number 2 in week 1, I have given you some indication of, in some of the loop, there could be 4 intermeshing points.

Especially, on the last course loop and the first course loop, we will always have 2 intermeshing points missing in those loops. So, this is the first course loop. So, that's why 2 intermeshing points are missing, but it is still a front loop. So, this is a front loop. So, to represent front loops, if you can see, this is the representation of front loop. And these front loops are connecting these 2 back loops.

So, we can simply connect like this. Okay. So, we can simply connect like this. So, 2 back bed, 1 front bed. Now, in the fourth course and fifth course, if you carefully see, this is technical back, technical front, technical back. Then, technical back, front, back. So, these 2 are similar. So, this needle will now again make technical back. This needle will also make technical back. This needle will again make technical front.

And this needle will connect these 2 needles. So, front bed and back bed loops are connected. This is the normal rib notation. In the fifth course also, it looks like same. So, this is the fabric notation for a double jersey fabrics. If you go by the box notation, box notation become even very simple. So, in the box notations, you can have 3 columns, because 3 needles has been used.

So, if you see here, there are 3 needles has been used. And there are 5 courses. So, if you see this one is the back bed, then this is front bed, then back bed. And this is first, second, third, fourth and fifth. Okay. So, in the first course, only technical back is being formed. Front is not making anything; so, you can see, so eventually the front is actually making the float. If you carefully see, this indicates that this needle is not catching the yarn, so it looks like a float.

So, that's why we will leave this box blank, because needle is not intermeshing the loops. So, if you see the float, it is represented by blank board. For the front needle, we will keep it blank because this is not participating. In the second course also, similar, 2 back bed needles are participating, front needles is not participating. So, the yarn is present in the straight form, in the back side of the front needle.

In the third course also, back needle are making back loops. But this one is now making front loop. So, this one, so this one is now front loop. In the fourth, again, these needles will be making technical back loops. This will be making technical front; then 0. So, this is how you

represent the box notation; this is point notation. So again, you have to be extremely careful in understanding the yarn path, because that will decide the diagram.

If you don't look at this, this diagram looks simple. Because, it is just, you can understand, these 2 needles are operating back; then this needle is making technical front. So, but in reality, when the fabric will be formed, it will have very complicated nature of yarn path inside the structure. So, this is how we represent and this particular structures. If you carefully see, the moment I am engaging 1 front needles, these 2 loops are now opening up.

So, because of that, there will be, hole will be created inside the fabric structures. So, this is how you will get the lace type of visibility on the fabric surface. Because, there will be a, definitely a bigger holes; you can, which can be visible in the fabric surface when you will watch it closely. So, this is how we represent this particular fabric. Now, let's go for even more complicated diagram.

I believe this is one of the most complicated diagram. If you understand this, then I believe that, in future, you will be able to represent any sort of fabric structure which belongs to weft knitting. Now, let's see again, this particular diagram. So, now I am going to follow only 1 notations, because, having representing 2 notation is taking time. So, now let's focus only 1 notation.

So, first, let's count how many courses you can see. This is, the black one is the first course. Then, this is the white one, you, if you carefully see; this is the white one. So, this is second course. Then, this is third course. You can see the free ends of the yarn. Then this is the fourth; you can see here. Then fifth, the black one. Then sixth, then white one, which is here, the bigger held loops.

Then, this is the seventh. Then, this is 8. This is 9. Okay. So, 9 free ends, you can easily see. How many columns you can see? 1 column, 2 column, 3 column, 4 columns. So, 4 columns, 9 courses. So, let's go for box diagram. So, you can make a table of 4 columns and 9 courses. 1, 2, 3, 4, 5, 6, 7, 8 and 9. So, 1, 2, 3, 4, 5, 6, 7, 8, 9. Now, you have to also identify whether this fabric belongs to single jersey or double jersey.

To find out whether a particular fabric is single jersey or double jersey, you have to see whether you can have any technical front as well as technical back loops on the surface. So, you have to identify technical front and back loops. So, if you see this black one, this is technical front, because the legs are on the front side. Now, if you see this bigger held loop carefully, the legs are going behind.

So, you can see, the leg side. If you see this particular loop, it is going behind. Okay. So naturally, this is technical back side. So, this column, the needles are operating on the technical back side, this column, technical front side. Again, if you go for this one, this needle, again technical front. If you see all the loops in this column, technical front. Again, if you go for this particular column, it is again on the back side. Okay.

This is back bed needles. So, first column is front needles. So, F represent front bed, B represent back bed; front bed, back bed. So, the idea here is like this. So, front bed and back bed. So, these are the needles. So, 2 front needles and 2 back needles. So, this is how the fabric has been created, especially this fabric. Now, let's denote the loop for each courses. So, if you go for the first course, the black one is technical front side.

So, you can make simply cross. Now, if you see this straight segments, this is not towards the head part, rather it is there on the leg part. So, this is in a straight conditions and it is not engaging with the old loop. Because, if you carefully see; so naturally, this particular loop is a float stitch, because it is in straight part and it is visible towards the; if you see this one also, towards the leg side. Okay.

It is not towards the head. So, the needle is not catching this yarn. So, when the needle is not catching this yarn, naturally it will be in a float condition. So, in that case, we will keep this box blank. Then if you go for the, this third loop of the first course, this is technical front, cross. And then, if you go for the back bed needles, especially this one, here now the yarn is towards the head sides.

And if you carefully observe, the needle movement, especially at this point, it is catching 2 yarns. So, one is this white yarn and this black yarn. So basically, it is holding 2 yarns loop. So, this is naturally a kind of tuck. Okay. So, cross, float. So, here you can see, this is the

straight part. It is not very engaging with the head. But here, it is with the head. So, one is tuck, one is float.

So, float, tuck. Now, if you go for the second one; second one, if you carefully see this movement, this is technical front. So, after that, if you go for the back side, if you see, this yarn is still moving and making a bigger held loop. So, this is the bigger held loop which runs for multiple courses. So, if you remember, whenever we make float or tuck, it is always associated with held loop.

So, this is also a kind of held loop. And this particular loop is made by the back bed needles, especially this needle on the back side. So, this will be a 0. Now, after that, after making held loop, it is again making front loops. If you see this one, this is making front loop, cross. After making this loop, if you go for the fourth column, it is again making technical back loops, 0. Okay.

So, carefully see, technical front, then this is technical back, then this is technical front, this is technical back. Okay. Now, go for the third course. Third course, if you carefully see, this is technical front, cross. Now, if you go here, if you see this. This particular legs part is now engaging with the head and this particular needle is having 3 or 4 yarn segments present in the same needles.

So, in one of the lecture also, I have shown you like how in the same needle can have multiple tucks in the consecuting courses. So, here, this particular needle is actually making 3 tucks. So, which you can see, it is holding this held loop also. It is holding the yarn from third course. It is also holding the yarn from fourth course. And it is also holding the yarn from back course. So, this particular needle is actually taking 3 courses at a time for consecutively 3 courses. Okay.

So, this is a tuck, because it is going towards the head side; so, dot. After that, you are making technical front. And after that, this is a straight yarn, so this is a float part. This is float, because this is a straight part. If you go for the fourth course, again this is technical front; fourth course. And then, you can see, this is again a tuck; so, dot. Then again, if you see this, cross, technical front.

And again, this is float. Now, if you go for the fifth course. This is fifth one, the black one, technical front. Now, you can see, again this is the bend part which is there with the needles. So, the needle is catching the yarn without releasing the old loops. So, this is again a tuck, dot. Then this again, black part, technical front. And then, this is a straight part, because the needle is not catching here.

So, this is a straight segment. So, this is blank. Now, if you go for the sixth column, this is technical front. After making technical front, it is making bigger held loop, which is technical back side, 0. Then if you see this one, technical front. Now, if you see this one, technical back. If you go for seventh, again the first column, cross. Now, after that, this part is blank, because this is float.

Then, this is technical front. Now, this one, if you see, it is going and catched by the needles without releasing the old loop. So, this is a tuck. So, in the seventh course, tuck. If you see eighth, again technical front, this is technical front. Then this is straight segment, blank box. Then again, technical front. And then, this part is catch by the needle without releasing the below loop.

So, this is tuck. Now ninth, again technical front. Then, this is again the straight part, not catch by the needle, so blank. Then again, technical front. And now, it is catch by the needle without releasing the old loop, so this is tuck. So, it is just, if you see, this is the repeated design. So, 3 consecutive tuck, then 3 consecutive float. Similarly here, when the first needle from the back bed is making tuck loop; then, next consecutive needle of back bed is making float.

Here, 3 float, that needle is making. The next consecutive needle of the back bed is making tuck. So, this is a kind of repeat design. So, if you keep following it, you will get a very beautiful surface of the fabric, which has different aesthetics. Although, the fabric looks extremely complicated, but on the diagram, it is much easy to understand. So, I expect you to do the practice of even more complicated structure, just to get confidence in this particular diagram notation.

The last fabric which I want to do it in this particular lecture also is, what happen when you have 2 different colors of yarn present in the same course. So, this is usually used in jacquard

type of knit fabrics. So, in jacquard fabrics, actually in the same course, some needles will be catching yarn number A, in some needles it will be catching yarn number B. In one of the lectures, I have given you demonstration on interlock machines, where even feeder was catcher by the cylinder long butt needles and odd feeders was catcher by the cylinder short butt needles.

So, you can assume that, within the same bed, some needles will be catching one type of yarn and other set of the needles can catch different set of yarn. So, it might be possible that, within the same course, there could be 2 feeds. And some needles will be catching 1 feed and other set of the needles of the same bed can be catching 2 feeds. So, in that case, the representations can be different.

So, I am giving you one of the simple structure in a jacquard knit design, where in every course, there are 2 colors of yarns are cached by separate set of needles from the same bed. So, first, let's see whether this is a single jersey fabric or double jersey fabric. If you see this one, this is technical front loops; if you see second columns, again technical front; if you see third column, technical front.

So, if you see the nature of the loops, any loops in a particular columns, they all are technical front. So, this is a single jersey fabrics. But how it is different? If you carefully see the color and follow the path of white yarn and black yarn carefully in every course, you will realize, there are 2 feeds going on same bed. Let's see the, from the left side. So, if you see this one, the black one; so, the black one is moving in this fashion.

So, it is not making anything in the first column. So, the first needle is not doing anything with the black yarn. Then, it is making loop on the second column; then third column, fourth column, fifth column, sixth column; and again, seventh needle is not doing anything with the black yarn. If you see the white, if you see, follow the movement of white yarn, the first needle is making loop.

Then, it is, the next 5 needles is not doing anything. And then, seventh needle is making loops. Okay. So, in the same course, when black loops are being formed, other needles are not doing anything. And when white yarns are cached by the needles, other set of the needles

are not doing anything. So, it clearly means that, on the same bed, some of the needles are allotted one type of yarn and some other needles are allotted other type of yarn.

We have such technologies, jacquard machines, which I will be covering later in this course, where you can individually select and give a yarn to each individual needles. You can, every time you can change the yarn feed and you can select individually each needles of the bed. So, that's even more complicated technologies. But, let's first focus on the fabric notation of this particular fabric.

So, naturally there are 7 columns. It is the single jersey fabric. So, 1, 2, 3, 4, 5, 6, 7. So, first course. So, in the first course also, you have seen, one time only black yarn has been doing one thing. In the second feed only, white yarn are not doing knitting. So, in the second course, this is basically again the first course only, but the selection of the needle is different. So, again; so, you have to, in the first course, you have to show 2 feeds; feed 1 which indicates the yarn color; and this is for feed 2 which again indicates yarn color.

So, this is the notations we have to follow. Let's make the diagram for first feed. So, first feeds, let's define this black one is the first feed in the first course and white one is the feed number 2. So, now we follow the black path of the yarn in the first course. So, if you carefully follow the black yarn, it is the straight segments, on the front side. So, on the front side, if you see, so this is the floats.

So, this particular needle is actually making float, at this location the black yarn. After that, there are 1, 2, 3, 4, 5; 5 consecutive loops. So, 1, 2, 3, 4, 5. And if you see the last needle, it is just making float. So, 5 consecutive loops, 2 floats on either side. So, this is the path of black yarn. So, if you see the, follow the black yarn, this is float; then 5 loops; and then again float. So, this is feed number 1, when, where you have feed the black yarns only to 5 needles.

You are not feeding black yarns. So, these 2 particular needles. So, these 2 particular needles are resting when 5 needles are operating consecutively. Now, in the next feed. This is again the same course, because the yarn is being present on the same course. If you follow the yarn path, so the first needle is now making loop. Then if you follow the yarn path, it is becoming a straight for next 5 columns.

So, it is actually making float. Then again making loop. So now, these 2 needles which was resting here in the first feed is now operating in the second feed when white yarn are feed. So, we are actually making white loop in the second feed in the first course. And next 5 needles which were making loops with the black yarn is not doing anything with the white yarn. So, that's why this is float. Okay.

So, black yarns are operating 5 needles, the other needles are not working. When other needles are working, then these 5 needles are not working. So, alternate is, it is basically selection of long butt needles and short butt needles alternatively. This is for the first course. We can move to the second course as well. So, again in second course, 6 needles we require; 1, 2, 3, 4 5, 6, 7; 7 columns. And for 2 feeds.

So, this is again course number 2. And we can again represent the black feed. And so, 2 indicates black color. And 2 dash indicates white color, white yarn. Okay. So now, if you follow the black yarn, 4 loops and then 3 floats. So, 4 loops and then 3 floats. So, 4 loops, 4 needles are operating. These 3 needles are not catching the black yarn. When the white yarn was feed; so, the 4 needles are not catching the white yarn; and 3 needles are catching the yarn and making front loops.

So, these 4 needles are not catching the white yarn and next 3 needles are catching the white yarn. So again, if you carefully see, these 4 needles are operating, other 3 needles are resting. When other 3 needles are operating, other 4 needles are resting. So, this is how you create a jacquard fabrics. And you can play with the color. So sometimes, at some section, one particular yarn would be visible.

On the other side, other color of the yarns will be visible. So, this is very, very useful when you make jacquard design. And you can decide the colors on the fabric surface depending on the float and the loop. So, on some side, you can make sure the loop is visible. On the other side, you can make sure the float is visible. So, this is how you play and hide yarns with these type of designs.

Although, so far, in previous lectures, we have not covered any machines which is capable to make these type of complicated structures. So, this particular type of structures are actually being formed on a machines which has the capability to control or select each individual

needles on the bed. So, in subsequent lectures, I will be covering one of such complicated advanced technologies where you can select any needles at any position on the same bed.

And you can decide whether it should make float, yarn or loop. So, again, you can see here, multiple feeds. Anytime, any particular needles can be given any color of yarn. So, such type of flexibilities is there in weft knitting. And you can go for any complicated design. So, just now, we have done with this. So, if you also follow this particular path of each feeders and each needles, you would be able to make the notation for these type of fabrics.

(Video Ends: 55:21) So, we finished fabric notation in this particular lecture. Now, from the next week, I am going to introduce you different fabric designs which I will be creating on single bed and V-bed machines, which I have covered already in the previous weeks. So, with these designs, I am also going to help you to analyze these structures, how when you create different tuck, float and other stitches in the fabric, how the fabric properties will change.

So, that is also very important from engineering point of view or from design point of view. You should not only focus on the design aspects of the fabric, but also you should be able to know how the fabric behaves when you play with different stitches. So, stay tuned. Thank you very much.