Manufacturing Systems Technology

Prof. Shantanu Bhattacharya

Department of Mechanical Engineering and

Industrial and Production Engineering

Indian Institute of Technology, Kanpur

Module - 06

Lecture - 35

Hello and welcome to this Manufacturing Systems Technology-Module 35. In the last module we have been discussing about the fixed sequential format. Let me just get back to this particular statement here.

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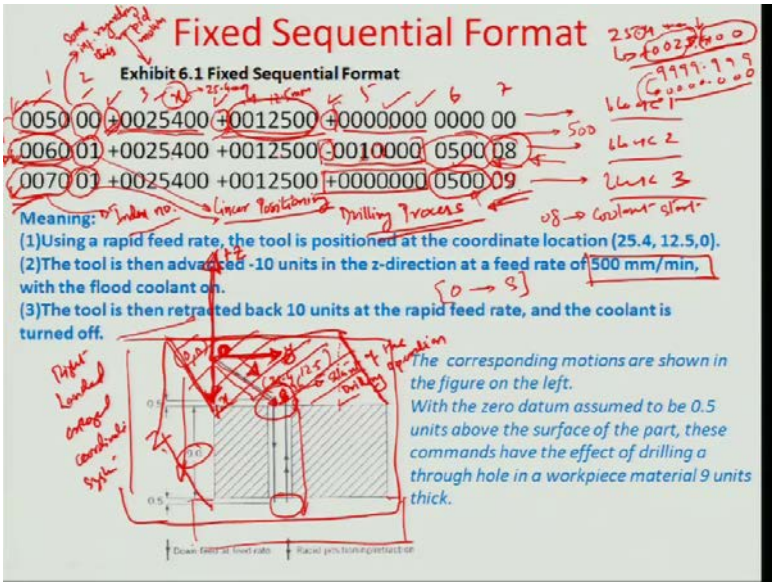

So, if you see in this fixed sequential format, you can see that there are many numbers again which are you know representing different things. So, I think we had learned that these are the different blocks and we had also learnt that these are the different commands in picture, so 1, 2, 3, 4, 5, 6, and 7 commands. Also there are positive and negative signs you know in the different commands. So, probably there is an indication of something related to the nomenclature associated with directions if you may remember that we had talked about last time. So, in fact this fixed sequential format is about a drilling process and let us understand what this formats says, so that the

controller does something in a very organized manner, so that you can do the machine drilling.

So, obviously if you look at this figure here, right about here, this is the work piece that is being drilled and the tool is positioned at some place probably which can be called as the tool origin, and there is a path of the tool which would get executed from this particular origin O to the machining center which is actually the point where the drilling starts. Let us call this point S. So, this is the start of the drilling operation. So, from O to S, there is a sort for rapid transit of the tool because this is really the time wasting part of the whole you know machining phase. Obviously, you cannot position the O to S because then it will mean that drill may start fouling with the work piece while placing the work piece and that something that you want to avoid. So, obviously, the tool has to be at a certain distance away from the work piece when the work piece has been positioned and plant in a particular jig where it as to be held and started with the machining operation of the drilling operation.

So, the O and S are different. The origin start point is different and so obviously, there has to be some kind of rapid positioning tool which I will actually talk about little later, but rapid positioning means the earliest possible time because its member here the drilling tool is the tip of the drilling is present actually here. So, particularly here, so the problem is it is not touching the work piece, you can rapidly move the drill in this particular area to come to S wasting as less time as possible. So, probably this 0 0, here would relate to some kind of information, some information regarding this rapid motion. You can see the numbers in block 1, block 2, and block 3 as 0 0 5 0 0 0 6 0 and 0 0 7 0. So, obviously probably this would be an index number. We already identify that the machine would read based on 1 to 10 or 1 to 3 in this particular case. So, it read first block 1, and then block 2, and then block 3. So, therefore, you know you can easily assume that the machine is reading first line here and recording into 0 0 5 0. Obviously, the next number it is going to read is going to be higher order number.

So, here the higher order number that it finds is 0 0 6 0. So, after 50 60 and then after 60 70, there is the spacing of 10 in between. It can vary between different programming languages in this spacing is typically given because if you want to let say modify the program some point time later and insert some kind of statement or line within these two index numbers, you already have a provision of nine numbers in between and nine

numbers statements in between which can come. So, fifty can be preceded succeeded by 51, 52, 53 so on till 60. So, these ten numbers have been left blank intensely because it allows the flexibility of the program to be changed later on and that is how the index number is been based. So, this is about index number.

So, obviously the first item here which appears to be having are holding plus sign should may be means something related to the motion along a certain access and the value that is appended to it may also means something which is related to the corresponding value, where the tool has to probably traverse. So, in this particular case for example, you can see that the first value mentions plus 0 0 2 5 4 0 0 and plus 0 0 1 2 5 0 0. So, what is meaning here is that probably this is the x co-ordinate of motion. So, wherever the tool was placed if you consider that to be the origin 0 and 0, so from 0 0, the tool has to move exactly at 25.4 millimeters. That is how the nomenclature has been laid here 25.4 millimeters along the positive x direction and 12.5 millimeters along the positive y direction. Obviously, there is no moment as of now in the z direction. So, we keep this sort of fixed. We can assume that actually this block is somewhat like this, and we can also further assume that you know the x, y is in the same plane as the s. So, we are not assuming that the x y is out of the block or something; it is in the same plane as S in this particular case.

So, therefore, you can say that there is a motion which allows this point O, the tooled point O to do exactly 24.5 and 12.5 millimeters. It is a very fantastic way of writing. So, basically you have written 25.4 millimeters as the number plus 0025400 which means that you are defining this dot in a manner by actually going four places to the left of the dot, and three places to the right of the dot. So, therefore the capability that the controller may have is to read between 9999.9999 to 0000.0000. So, that is the range at which the controller would be able to read in terms of millimeters. So, that is the reason why this concept of 25.4 being laid out as 0025400. So, you are actually enabling the controller here or the programmer here based on the capacity of the controller of course, to give a range of values corresponding to the x value here starting from 9999.9999 to 0000.0000, and some value which is probably the actual value here is recorded in this particular number is 0025.00.

Similarly, on the y access as 12.5 millimeters are 0012500. So, these are all on the positive x and the y direction. Obviously, positive x and y direction would mean that if

you consider the depth starting from this plain onwards here to be the z access, then the positive z direction obviously is in the direction projected away from the work piece plain. So, I can consider this to be the plain of the work piece as I had mentioned before. So, this block is positioned somewhat like this. Sorry, let me just redraw a little bit. So, the block is position somewhat like this and similarly you have the block positioned like that. So, this is the surface along which the tool is place somewhere away from the block and the tool is being dragged along exactly to move 25.4 mm towards the positive x direction which is this direction and also 12, sorry, this direction 25.4 mm and 12.4 towards the positive y direction. So, this is how you are placing the x y z coordinate axis. This is a right handed orthogonal axis. You have to make sure that you are having a right handed orthogonal you know coordinate system. So, you have the x motion along the positive x direction here, the positive y direction here and the positive direction z direction away from the face of the work piece. So, in this manner you are bringing the tool from the point O right about here at least 25.4 mm in the x direction and 12.5 mm in the y direction, so that you can hit upon the point S in this particular plain.

So, I hope I am clear here actually and then, you have finished this. So, the z direction right now is 0. So, we assume that the tool is almost at the work piece tool interface and then, we are suggesting so basically you know there may be a possibility that you may allow a little bit of allowance in the z direction earlier, but in this particular case we did not because of the you know because of the simplicity in the programming that would happen because of allowing it to just about the tips. So, in this case it is situation where there is a block and the drill tip has just about come close to this probably placed, it was placed somewhere here from which the drilling position is somewhere here. So, the drill tip has come to this position and then, it is allowed to rotate and you can see the next block that is block number 60 here which talks about this.

So, here the one thing which is important is that you cannot rapid position anywhere because obviously now the cutting motion is going to start. So, there has to be a feed rate with which the drill would be governing emotion inside the block. So, there has to be some kind of a linear feed rate. So, probably these 0, 1 right about here means something to do with linear positioning, and linear positioning is different than rapid positioning. I will show you exactly what is the difference in a little bit little slides, but linear positioning would be at control rate positioning at certain axis and then, obviously you

are starting from the same position 25.4 mm and 12.5 mm with a linear positioning and before starting you have switched on the drill machines, so that it starts rotating. You have switched on the drill machine and have started to give into feed you know and this feed is given in 500 millimeters per minute. So, it is down feed, is a linear feed in terms of 500 millimeters per minute in the negative z direction. Therefore, you are also at the same time given a different index value to this z coordinate here which mind you was 0000.0000 earlier which was at the surface of the block, but now you are giving a negative sign meaning the tool is proceeding towards the work piece and it is proceeding around 10 units. That means around 10 mm within this particular drilled hole. So, typically whenever you drill a hole and it's a through hole, then you have to ensure that the drill tip goes to the other side of the block.

In this particular case, the block is about 9 mm thick. So, you must be putting something like wood or something which is you know bottom which is amenable to this drilling process and let the drill traverse all the way from the 0, z equal to 0 point at the surface all the way to about 10 mm, so that it clears off the hole and makes it through hole. So, once this negative 10 mm at the rate of 500 mm per minute has been achieved with the rotating drill, obviously you have switched on the drill, you need also coolant do that. So, you have started the coolant on by saying 08. 08 is an option probably for a number which indicates that the coolant should be started. So, coolant start I will say and then the question is the drill is now not left in that position rotating. It has to be taken back to the top position. So, therefore, now because you are using absolute positioning system, you have gone z mines 10 and you have to come back to z 0.

So, therefore, in the third step or the block 70, you are seeing that the position x and y are not changing. Again it is going in a linear manner. So, linearly positioning itself, but it is starting from minus 10 right about here and the next position once it has gone to minus 10, there is no job to do any more. So, it comes back to the 0 position. That means, from here it comes back to the surface here and still the feed rate has been continuing because obviously the problem here is that we cannot repeat any command, and so the 500 has to be mentioned. So, this is done at the same 500 rate, but now maybe you do not use the coolant because already the drilling has been completed and it is just the extraction process. So, therefore, 09 here mean that the coolant has been switched

off. So, this whole modality explains that how a fixed sequential format can be formulated.

So, in the next module we will like to do the Tab Sequential Format as well in a similar manner.

Thank you.