Design for Quality, Manufacturing and Assembly
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Lecture – 22
Mold Cost Estimation – Tutorial

Today's class we will see one tutorial by which I will explain how to use this method on estimating the tool cost, ok. We will take one example part and we will go through this whole process. So, typically plastic components may have different you know complexities, and I have not taken a very complex part but it does has fair amount of detail.

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So, this is the plastic component whose picture you are also seeing on the screen. So, this component is made in this orientation, because I can see the seam lines here, ok. Here I already have the part so, I am telling the direction of the mold opening and closing direction based on this. But when you just have a CAD model of this part then you as a manufacturing process planner has to decide in what direction you will keep the mold opening and closing direction. Whether you will keep the component like this and open and close the mold or you will keep the component like this and open the mold or close. In whichever direction you will have the least cost associated with the machining of the mold you will choose that, right. You need to avoid as much undercuts as possible.

And, in this direction seems to be the best so, that is why you see that the parting line is visible here ok. So, the component is in both halves of the mold and you can see that the ejection pin impressions are available here. So, it could be in two ways possible. So, one could be that the component is like this and you have side actions in this way and the part you know is ejected out of the mold.

So, based on this let us try to see how the cost estimation is done by the Dixon and Polis method that we have seen, and also we will try to see how it matches with the estimate given by a mold manufacturer.

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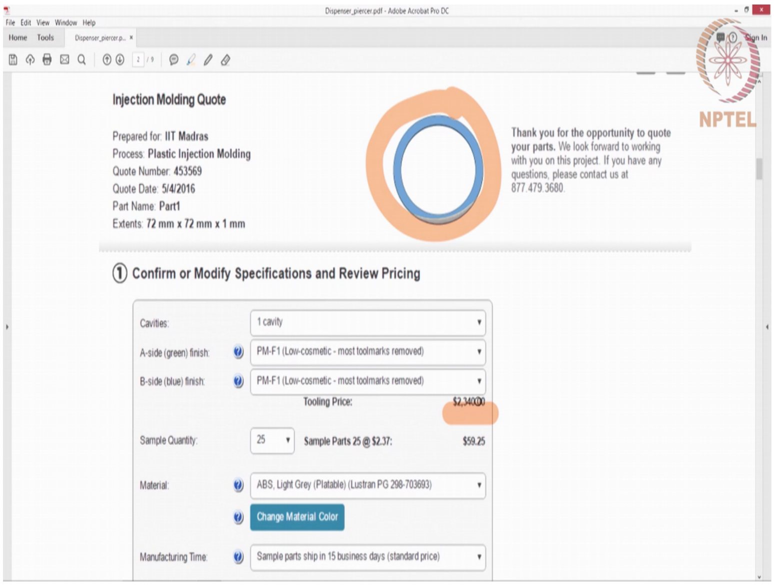

So, first we get the cost of making the mold for the standard component. So, you can see that this component is the standard component and the cost of making the mold for this component is roughly dollar 2300. So, to do this exercise you will have to approach a mold maker and get the code for making the mold for the standard component which is that annual disc, ok.

So, this is required as the cost for making the mold for the reference part. So, this is the cost as estimated by the mold maker.

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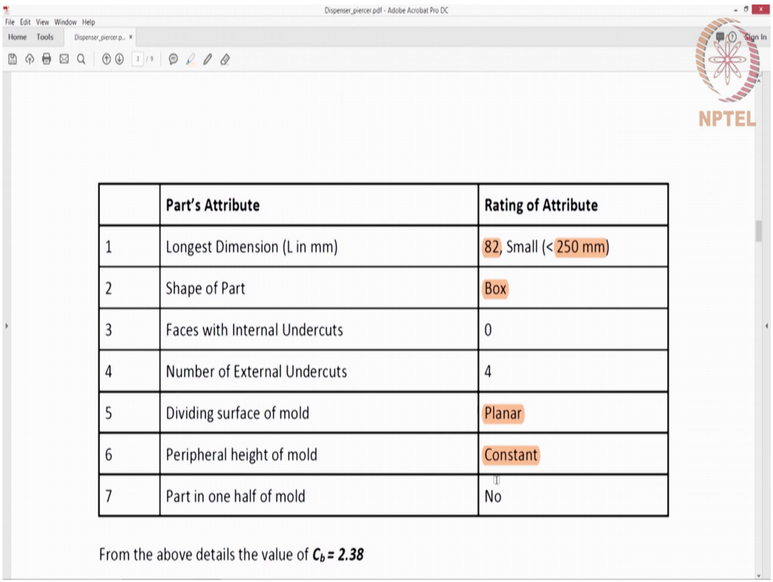

	Part's Attribute	Rating of Attribute
1	Longest Dimension (L in mm)	82, Small (< 250 mm)
2	Shape of Part	Box
3	Faces with Internal Undercuts	0
4	Number of External Undercuts	4
5	Dividing surface of mold	Planar
6	Peripheral height of mold	Constant
7	Part in one half of mold	No

From the above details the value of C_b = 2.38

Now, we will come to determine the relative die construction cost first which is CDC, so the length of this part if you could see this roughly about 80 mm. And since it is less than 250 mm it is small part and you can see that the aspect ratio of this part it is not a flag part, right, it is a box part, ok.

Faces with internal undercuts: you do not have any internal undercuts which are to be machined on the cavity on the core side, ok. The external undercuts if you see there are about several features that needs to be machined all of these right, they are all external undercuts to be machined, ok. So, is the dividing force the surface planar yes, I can have a straight surface and the dividing surface is also constant it is planar as well as the height of the surface is constant, ok.

And, part whether it is in one half of the mold is a part in one half of the mold: no, right? It is on both the halves of the mold. So, it is no. So, corresponding to this if we see the basic cost it is 82 mm with the number of external undercuts to be 4, ok.

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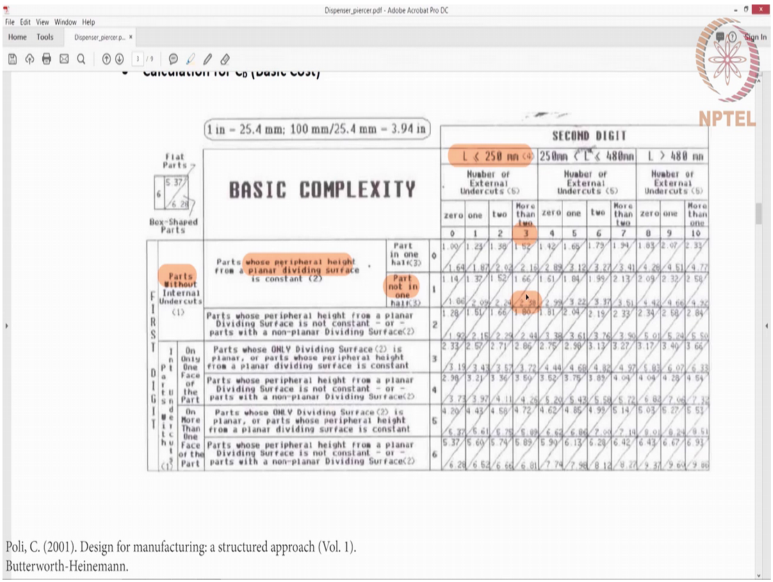

So, you need to take under this number of external undercuts more than 2. And parts without the internal undercut parts whose peripheral height is constant and part is not in one half. So, this is the number that is 2.38, ok.

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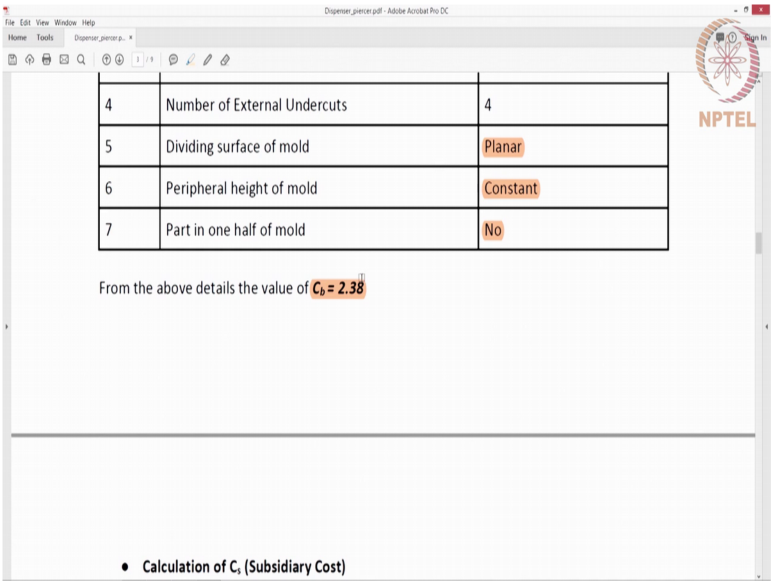

So, this is the basic cost of making the die, ok. Now, I need to understand the subsidiary cost, I need to understand whether it is a moderate or a low cavity detail.

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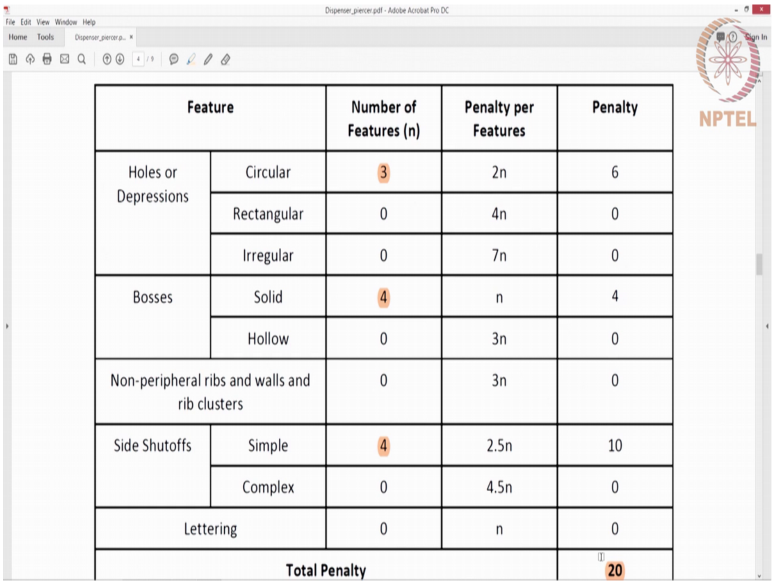

Feature		Number of Features (n)	Penalty per Features	Penalty
Holes or Depressions	Circular	3	2n	6
	Rectangular	0	4n	0
	Irregular	0	7n	0
Bosses	Solid	4	n	4
	Hollow	0	3n	0
Non-peripheral ribs and walls and rib clusters		0	3n	0
Side Shutoffs	Simple	4	2.5n	10
	Complex	0	4.5n	0
Lettering		0	n	0
Total Penalty				20

So, I come to see in the number of features that I will have to machine. So, these are the features that needs to be machined, right these holes. So, there are now several features that needs to be machined on the on the surface. So, you can see that there are about three circular features in this and there are some bosses to be made, ok. Essentially it is simple there is some side shutoffs these kind of features that that are obtained in the mold opening and closing directions are called as the side shutoffs.

Like these features, I do not need to specially machine because in the mold opening and closing direction itself, I can get these features I do not need to have any side you know action. So, these are those four you know this side shutoffs. So, these numbers gives me total penalty of about 20.

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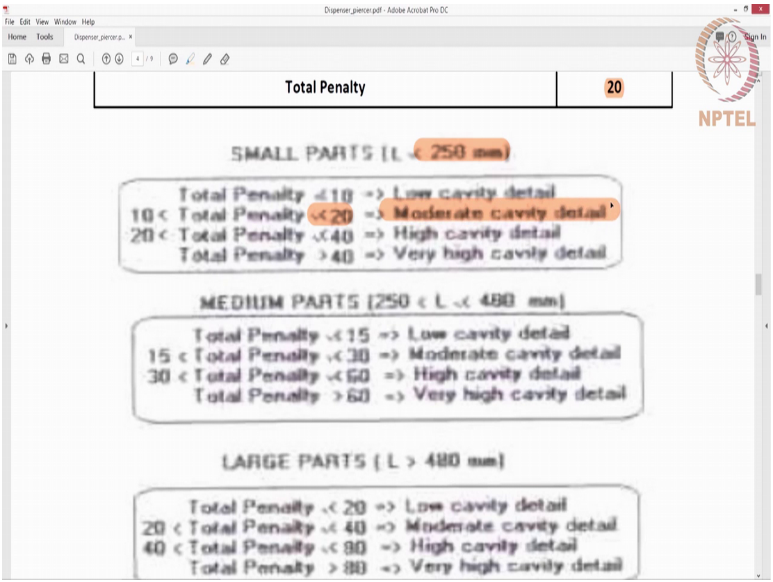

So, for part size of about 80 mm this is low come so, low this is L less than 250 and total penalty is less than 20 is coming to be a moderate cavity detail.

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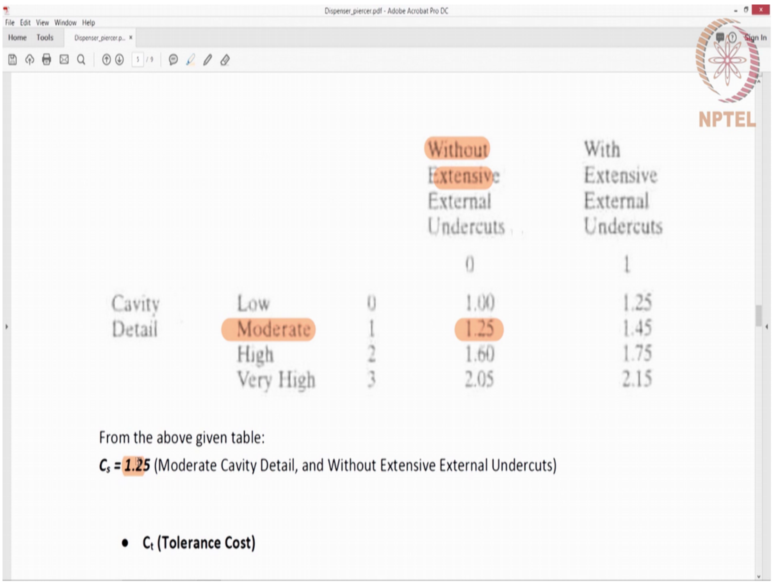

So, I have moderate cavity detail and without extensive undercuts, so my subsidiary cost is 1.25, ok.

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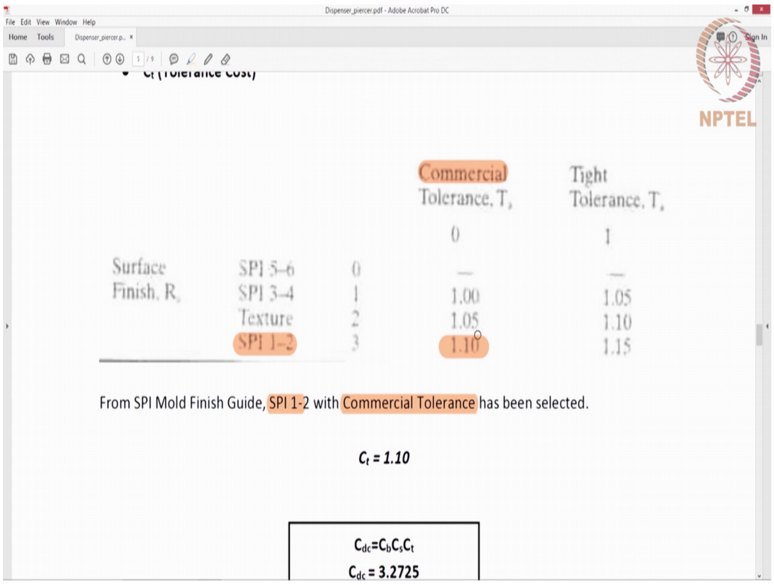

Next is the tolerance cost. So, I am choosing a SPI 1 – 2 with commercial tolerance. So, I choose this SPI 1 – 2 with commercial tolerance. So, my tolerance cost is about 1.10.

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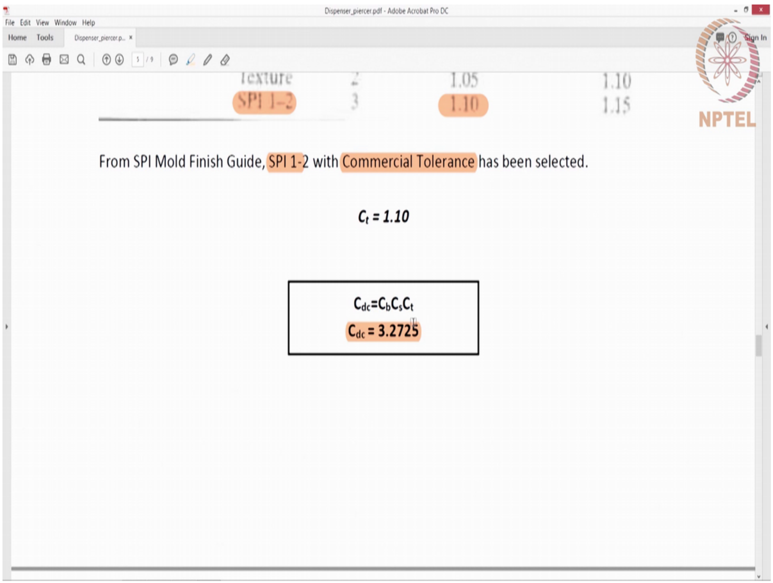

So, I multiply all these three numbers to get the die construction cost which is 3.2 or 3.3 times the reference mold you know die construction cost. So, this is just only one part of the costing. So, in the total costing this is 80.8 times this plus 0.2 times of the material cost will give you the total relative cost.

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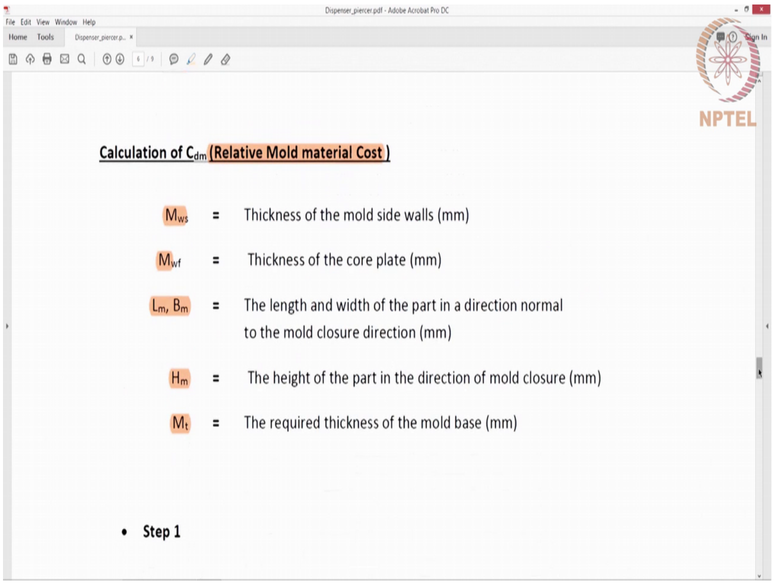

So, now I compute this relative mold material cost for which I need to determine all these quantities as I described in my lecture, ok. So mainly I need to compute M a and M t which is the projected area of the mold.

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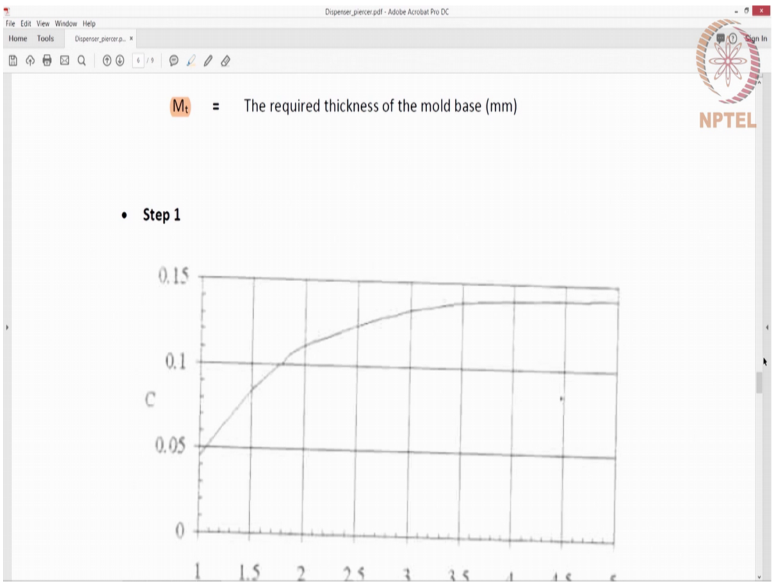

Or the projected area on which you know I am going to hold the mold, ok. So, first I determine this value of C.

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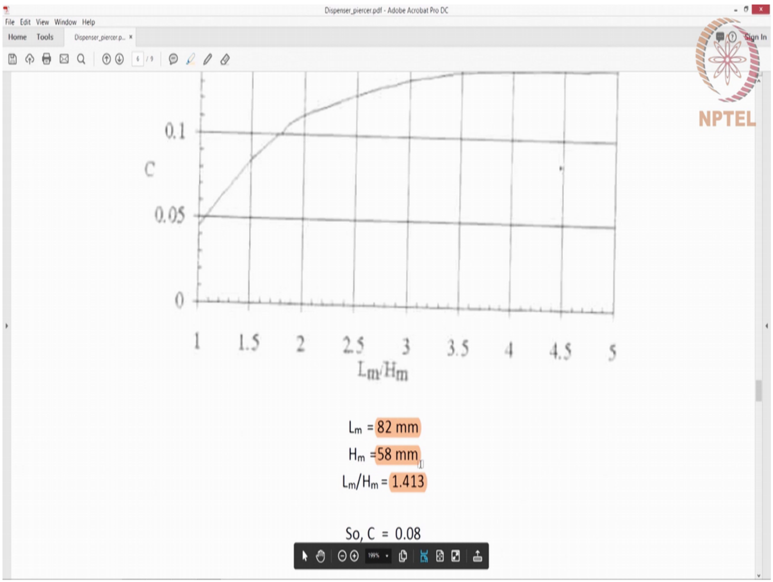

So, these are my dimensions the length the height of the part based on which you know I get this ratio. So, for 1.4 roughly I will get my C to be 0.08.

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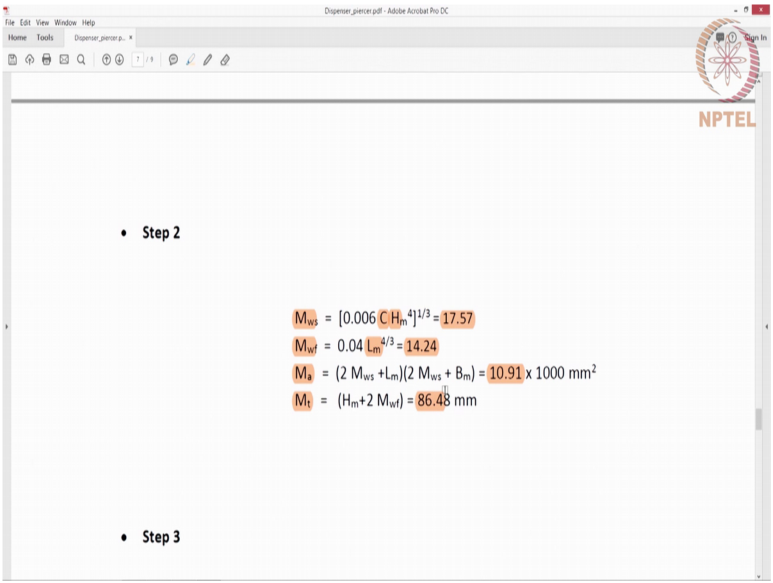

So, once I have the value of C and I know the height I can compute M ws which in this case turns out to be 17.57, and M wf is once I know L m which is 82 mm I get the value of that. So, once I have this, I can get the projected area M a is computed to be 10.91 1000 mm square, and the thickness of the mold plate is 86.5 mm.

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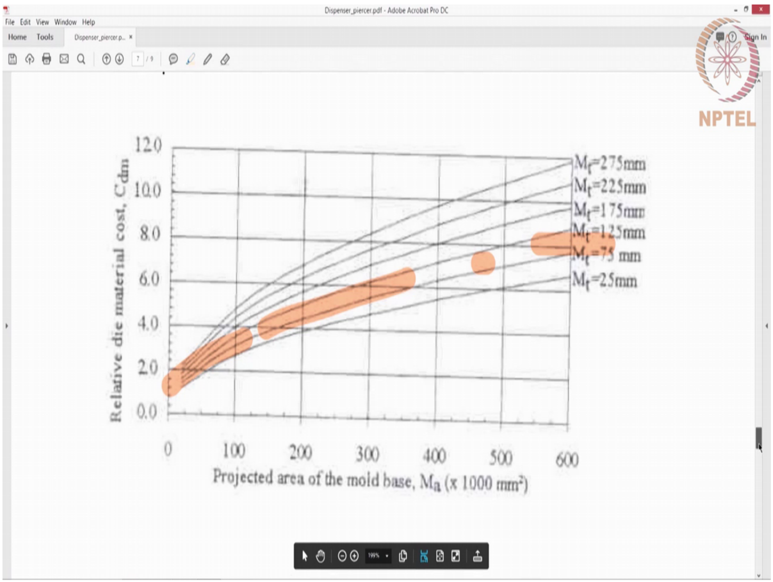

So, I use this table or the graph. So, I have 10.91 it is the projected area. So, it is very close to somewhere over here and my mold thickness is roughly 86 which is somewhere in between here. So, I should be I should be follow in this path, ok; so by extrapolating this graph very close to 0, because on this scale if you see this is 100 into 1000 mm square. So, I should be choosing some value very close over here, ok.

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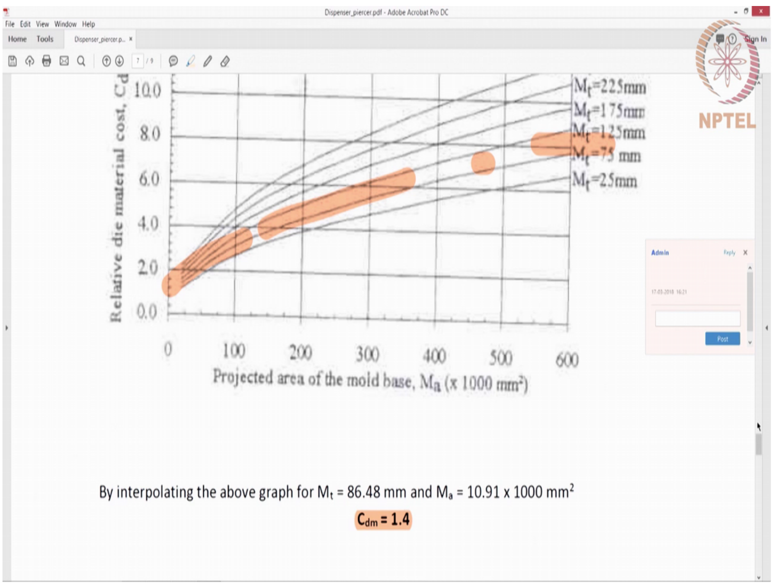

So, the value could be roughly 1.4 or so, ok. So, this is your die material cost. So, once I have the die material cost I can compute the total cost as 20 percent of this plus 80 percent of the die construction cost.

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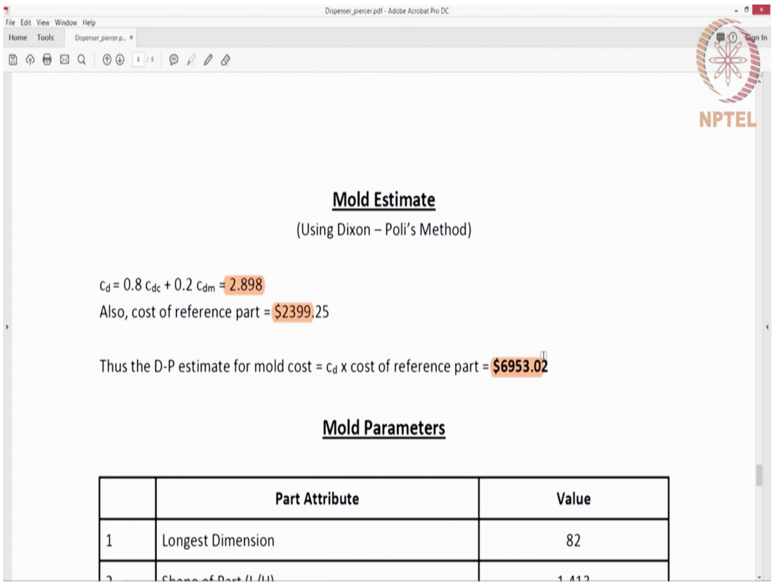

So, which is 2.89. So, that means, the cost of making the mold for this component is going to be roughly 2.9 times the cost of the reference part the mold making charges. For the reference part for the reference part this was the cost obtained. So, the costing for making the mold for this component comes out to be about 6900 dollars.

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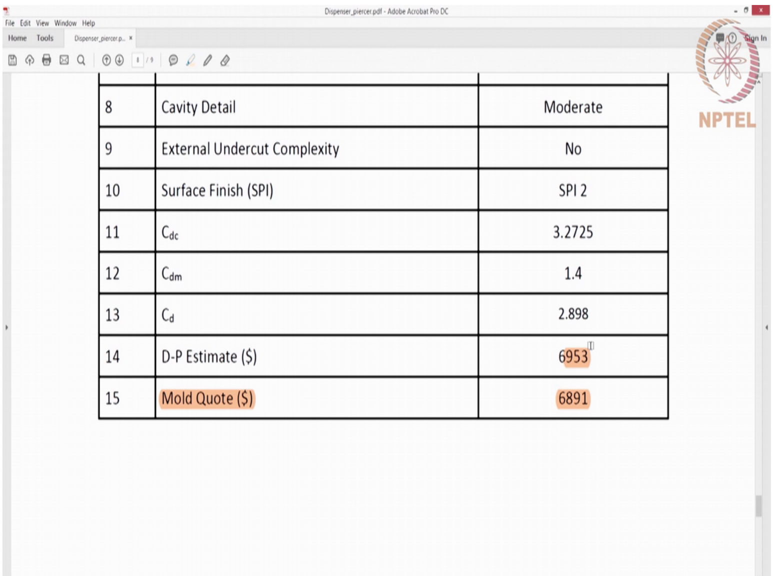

So, these are the features. The mold quote obtained by from the same company is roughly 6800 dollars, ok. So, again we see that there is a reasonable agreement between what we have estimated right and what is being quoted by the mold maker, right.

So, the idea is that once I know the costing for the reference part I do not need to give every time even the part design to the mold maker to get the estimate, because many times even the part designs associated with iterations they are all you know you want to have protection of the design data and so forth, right. So, you could use these kind of tools within your organization, inside the design team to get the estimates before actually going for the manufacturing or giving away the part design for making the tool.