Enclosure Design of Electronics Equipment
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Lecture - 57
Product Detailing

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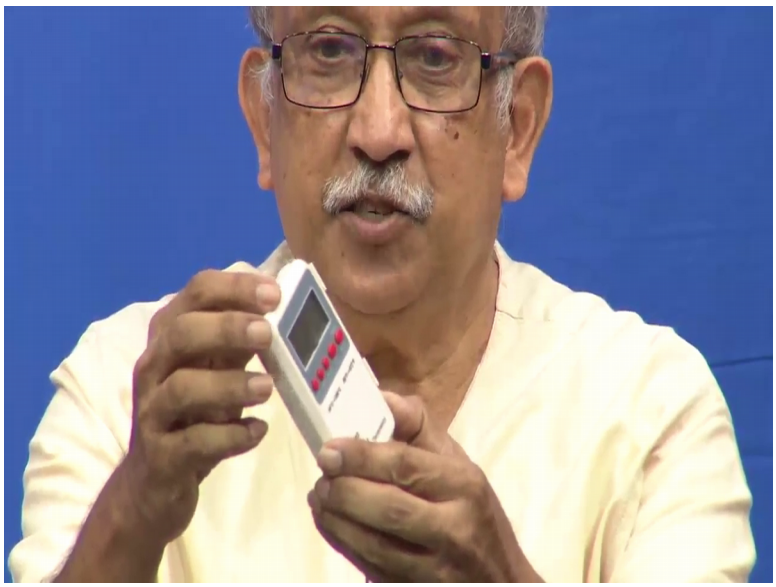

It looks nice you know one of the reasons is because though it is actually a bulky instrument, they have added a well here to make it little smoother as well as more convenient to handle. Similarly at the back also except that you see carefully the chamfering which is shown here is little steep compared to this, and then various things have been added here and then something in the front this is regarding the what you call various things, and then what you call various aesthetic and ergonamic concentrations.

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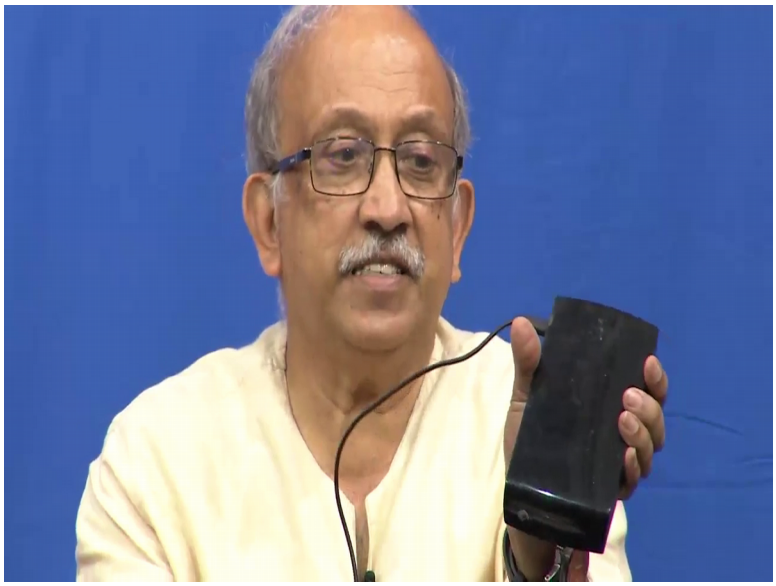

And then what they have done is they have also provided a small gap here. So, that when it sits the inside edges sit flesh and this is been what you say this is universal, I think earlier also I showed you about it front flat and then a beautiful design here it looks a little high tech and then you have something here and then there is a corners, somebody has made models out of it and try to find out that these look better. This is a earlier hard disk seen this there is a beautiful curve here in the front, and the same thing is reflected at the back. So, at that point of the time then there is a another gentle curve here this there is a gentle curve here, and the whole thing is something which is desirable and which is wanted and so on something to prevent it from moving on the board.

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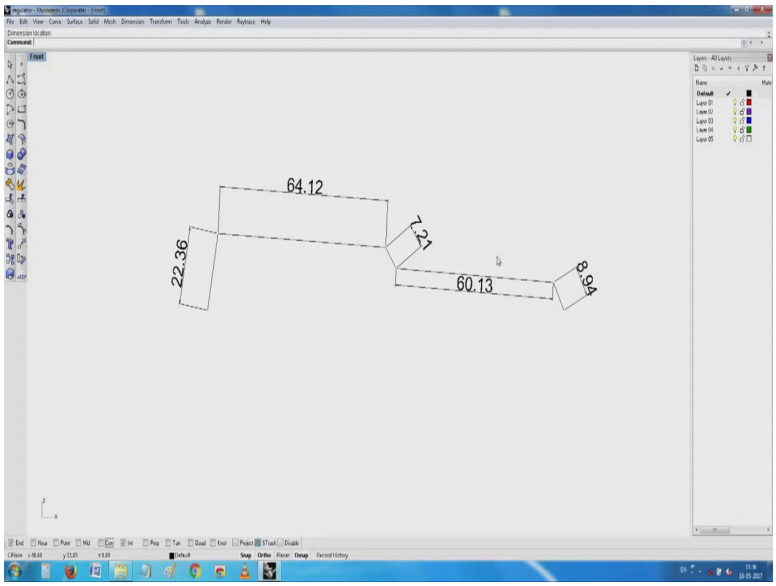

Now, thanks to cad we need not worry too much about how these you call dimensions do they make sense or not. So, what I will do now is I will try to see if I can straighten this piece out, I have this and this 22.36 did not change, but it got straightened out. Now I will pick this whole lod and see next piece got straightened out I noticed that here now things are not so good straightened straightened out.

(Refer Time: 03:48) nice it is straight and added to that we have total dimension of the blank, and where all we can do the various types of operations in this, and we have not compromised on any of the design dimensions, we have started with. Now comes the important thing is that we go the fabrication shop find out how to include the building allowance, depending on the thickness of the material, depending on the flow of the material, do add an allowance or do we subtract an allowance and are we using coining or we using air bending or we are using folding where part of the thing and all that is there, but the starting point is very much possible for us randomly here, I will give you bending allowance of 1 m m. So, easier for me now to just move these along, I have selected the points with which we play around watch the 64.12.

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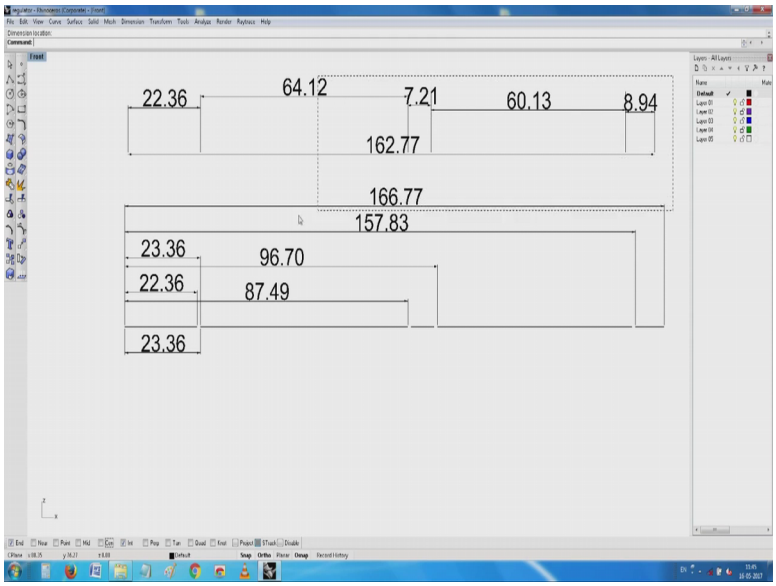

64.12 has become 65.12 I have added a 1 m m bending allowance somewhere in these lines, this is where you need to carefully watch out what can happen. So, another way of doing it instead is I will leave the lines as it is, and try to physically add a bending allowance here by offsetting this point here. See there is a small gap I have had a 1 m m here and then from here I will try to I will do faster.

Now if you see though from a distance you cannot see it here very conveniently without having to worry too much about what has happened there I have added the bending allowance. Now the next point is when I now try to dimension it again depending on of course, and depending on if we are trying to use a programmable machine, you see that 22.36 has become 23.36. So, I will be little faster from this point.

Originally our construction started with some idea of what we wanted based on the probably internal size. Now it the 4 points I have added a 1 m m bending allowance, you will see that overall my blank length has gone up very nicely without my having to worry too much about it. Now comes the important as to why I did all this and then I try to delete all this and then come back to old views as we have seen before; pardon me for going back and forth we come to this important question of what happened. Now what happens to all the bending allowances and all we have added? Now here we need to go back to the old exercise what we have shown you, you should have the dimensions and the part that is required after all the operations have been made or the part drawing issue.

So, if you go back to our construction line, you see that was only an imaginary line it was just an imaginary line for which it needs to be done now we have to take the important decision of where you wanted as an internal or you wanted as an external dimension or would you like it to have half of it here and half of it, there how do you go about building all these things. So, I will try to quickly go off into see here what can be done. You remember this is a simple profile maybe my trying to make it thick does it help yes and no only one thing here you notice is it is a serious issue about the what you call radius has not been mentioned here. Two radiuses are very very critical one is the machine or the bending tool has a inside radius like cannot we have something like this no this is where the coining takes place.

So, the radius of this no this is very very critical that forms the inside radius, and afterwards you have the sheet thickness itself outside radius comes here, but; however, if you see my drawing now very conveniently it ignores everything. It shows you know perfect like this and maybe something is done. This is where proper advanced sheet metal packages take care of the internal bending radius as well as the external bending radius. Just to sort of show you how to make the filleting, I will give a radius of 0.5 m m for the inside bends. See here from here to here is a 0.5 m m internal only is remember see internal has become 0.5. This has to be continued in all the places where the internal has to be done here can you see here I have a beautiful internal radius also.

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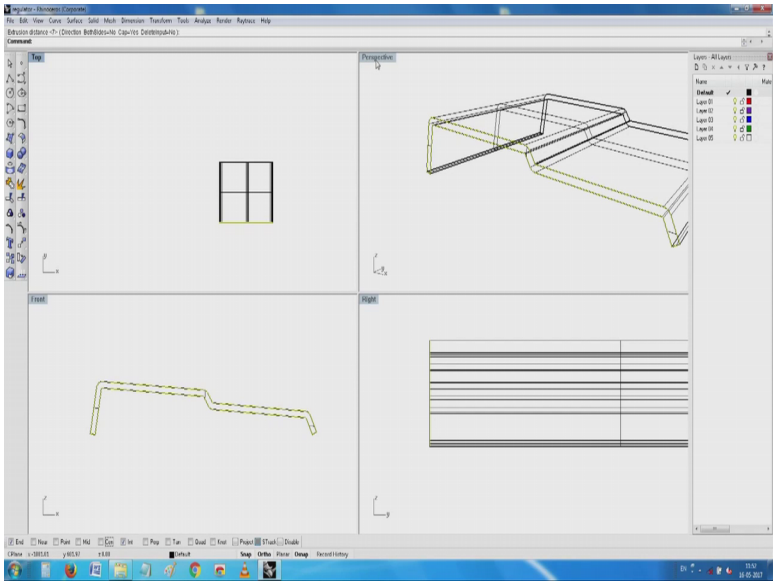

Now, in this case to so, that the visibility is high and so on, and the same thing I can use for using for plastics I have used a large thickness of 3 millimeters typically it is a one eighth inch acrylic or p v c or polystyrene or polycarbonate sheet. So, we have this beautiful thing here, now I will try to quickly point five was internal I will add 3 m m and then make the filleting. The radius is now outside is going to be 3.5 you have seen here slowly things are.

See this looks more like a natural piece, in the case of plastic you can completely avoid all these filleting inside because you can take any of the two pieces cut and just stick them together you to need to emery or sandy surfaces and stick them together. So, I can go back and create this directly in acrylic coloured acrylic is there, and then depending on how serious are how important is the surfaces and so on. You can always decide the overlap oh let me put it here, saying what does this overlap or this is overlap here I think I will start here does this overlap here or overlap here or you would like to make it into perfect you know join together peacefully in corner like this. So, this is valid both for sheet metal as well as thermoforming.

We have things which I am sure you would have seen the blister packs, for which most of the things come by all blister packs are essentially thermoformed you have a former typically the former has T shape and then I keep the sheet on top of it they heat it and then vacuum is applied and takes the natural form of all these things. So, thermoforming is just talking about the heat part of it the other vacuum forming is applying a vacuum on the base. So, such things can easily be made by thermoforming; having done this now comes to the other point of how to lay it out and then how is it going to look anyway. So, allow me to go a little faster again, I have now something which looks quite how to say interesting I have create made all this whole thing into a single sheet.

Now, I will try to make a solid out of it by extrusion oh seems to work. Now if I give a trended image you see here I have a very nice beautiful object it could have been sheet metal or it can be thermoformed. Now we need to worry about how to what do we do with the bottom piece of it, you notice here we have started with a line here that line is probably still sitting here somewhere you have seen that. Now can we use the features of this line like this internal surface now, which should go and meet the internal surface and then try to make something which is in the other direction this is where all our skill end you know various things come about. Top portion was relatively easy now how do we

make the bottom portion. gGood proper packages they work in a very intuitive and nice way in this case I will forced to do a little bit of a an exercise saying now how do we create something which has edges; however, it has a thickness like this that it is not easy, but it can be done not easy, but as I said no very easily it can be done. So, what I need to do is make a (Refer Time: 19:50) and then try to see whether I can you know cut it and so on right. Now what I will do is I will hide this or delete it even better is delete that thing.

Seen that now I will see what best I can play around and see whether you know something can be done with it. I have started with a simple line to see if it helps me what I can do with this line here, here slowly now we are getting into a little bit of what are called Boolean operations and how to make things match and so on. I showed you this when we started with the sheet metal exercise what will happen into the corners and so on. There I had done it, but not on the fly here meaning somebody has actually helped me, now I need to we know figure out what to with this line I have a beautiful line here now do I (Refer Time: 21:40) state like before and take it here and see whether I can trim it such that the bottom fits nicely I will see how best I can manage it.

See there I have created something else in the other direction; once again we end up with having text to date and see how will it fits or does not fit let me try my luck. So, I have this beautiful device here and once again I will try to see if I can fill it the curve as I have shown you earlier, I fill it this point. Now again I fill it the outside curves oh sorry well so far so good have a beautiful a device to carry out the extrusion. Now I will look at it in this I am sorry I need to join the whole lot first explode and join it make it into a single curve, and then see how well I can carry out the extrusion. Now as before try to see if I can do something about it and specifically not bad, I am somewhere at least except that you seen it seems to be not very well done, it seems to be no heating each other and not.

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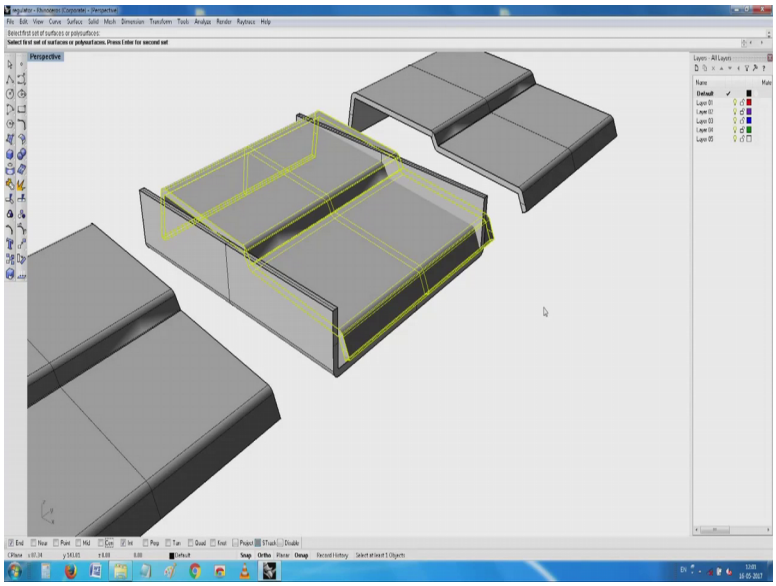

So, great and all that there is something I can do about it to improving that is where as I said now all the Boolean operations things will come. So, I do it in a very crude way just to make sure that it works well. So, I have three instances of this sitting here since the three of them, I have here just to check whether I can do something with it.

You have seen something is sitting here something is sitting here, I will see what best I can do with it whether I can trim it whether I can I am not very clear what I can do with it, it looks like it is very much possible for me to trim this into several surfaces and then now I will try to attempt to use this top surface return it does not seem to work. I will now let me try actually surfaces can be trimmed by exploding with the other surfaces, I will see whether I can try to do a what you call difference between this see what has happened? I do seem to have ended up with something which is what I was looking for can you see it has a beautiful appearance which I was looking for all along, only thing is I need to do something and get rid of it see this is what I was looking for. If only had paid a little proper attention and got this setting properly, probably I would have I will keep it back where it was and now put this there and see whether what I can do with this there again I try to do the difference.

See I have got it seen this I have a curve is generally alright except that at this point it did not get cut fully. My problem was that at this point if I lowered it a little probably I would have achieved what I wanted. So, I will now go back I will go to the undo point of

it, I will again go back to the undo go back again to the undo. See here now if I see the corner here that it looks like is where actually the problem has started seen that.

So, if I fall over the original construction lines and then fall over the manufacturing issues which I was talking about, it all it requires is probably I need to lower it a little you see here now it seems to cut properly except very small thing here, which. Now if we see here chances are this will work without any problem, all I need to do is take this piece remove this material in it and it works it nicely sits in place. So, I will stop here and then try to continue next time with go back a little and then try to remove all the offending things make a proper what you call layout and then try to work with it I will continue with it so.

Thank you lets meet again.