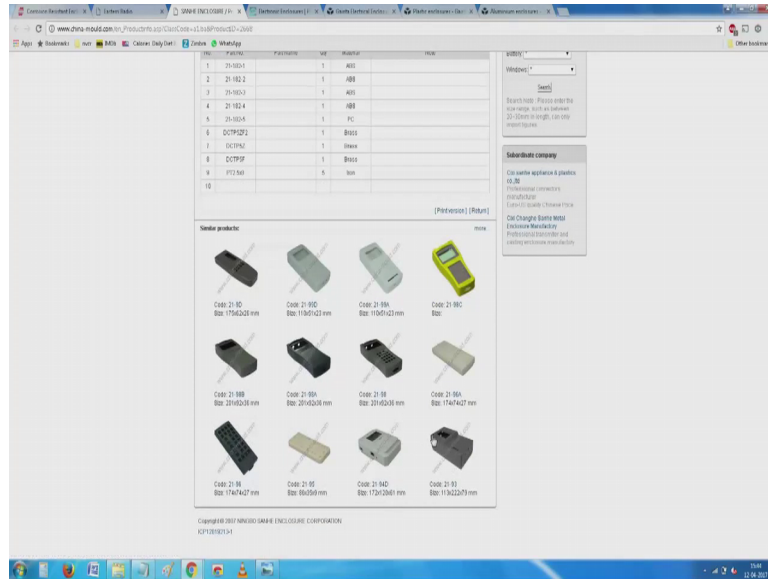


Enclosure Design of Electronics Equipment
Prof. N V Chalapathi Rao
Department of Electronic Systems Engineering
Indian Institute of Science, Bangalore

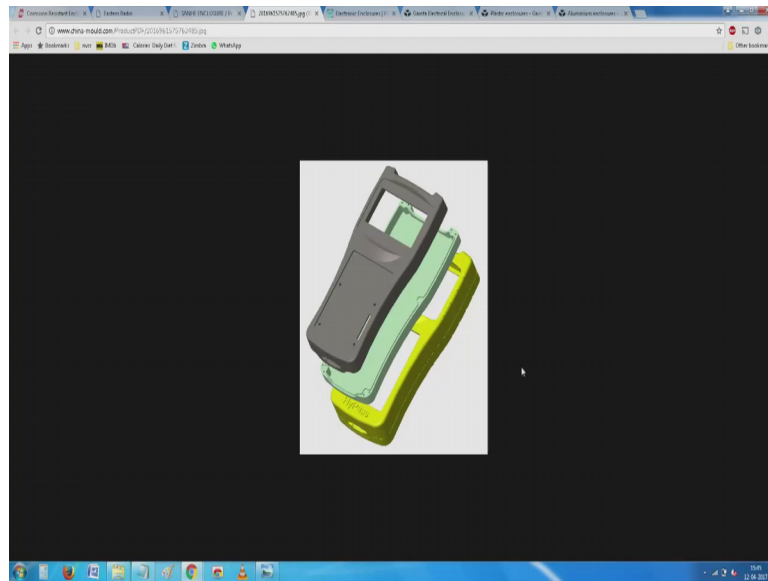
Lecture - 30
Application documentation and Selection

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Anything you can think of, somebody has already known and has made it available for us. Seen here I am very impressed by such a made, what you call information which is directly available for us. If you remember the very early drawings I showed you invariably had things from here.

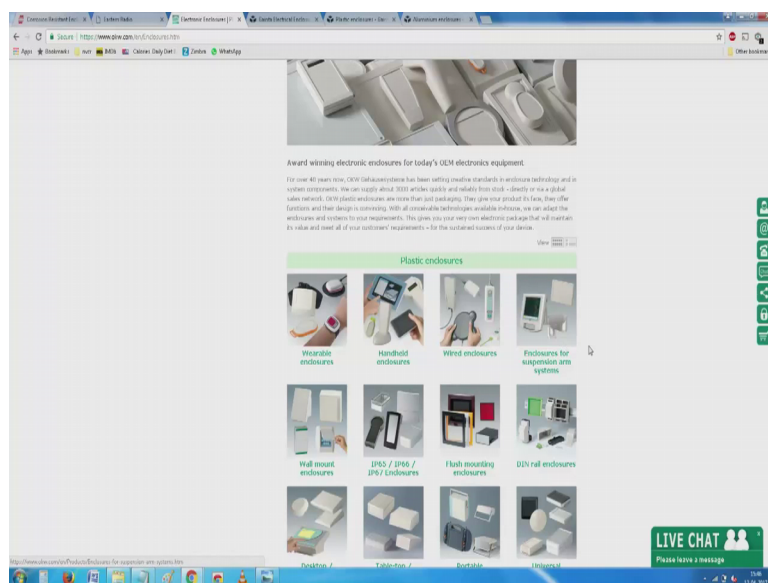
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You see here very carefully if you see there 3 or 4 know variants of it there is a bottom there is a top the bottom most shows how it is put together and then I do not know whether it is matching plate and should try to.

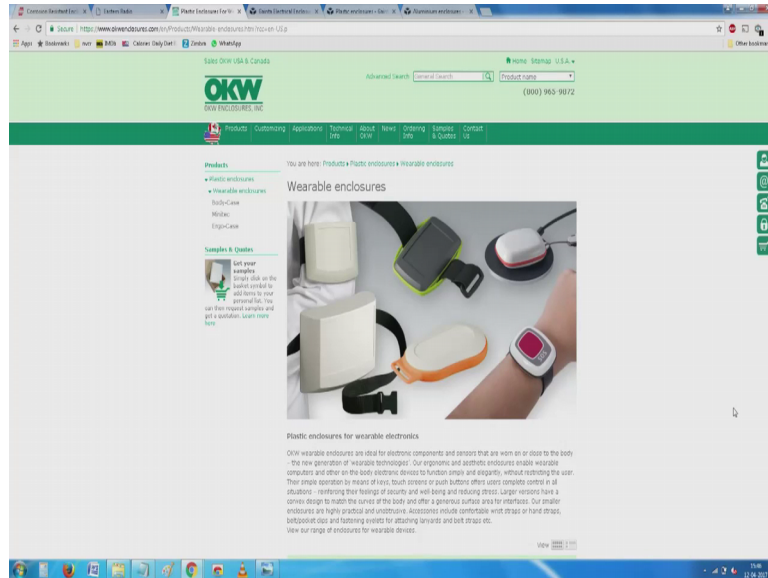
Now you can build your own equipment directly on this all you need to do is try to understand these things. Only problem is there are not as inexpensive and easily available as we think as would want to.

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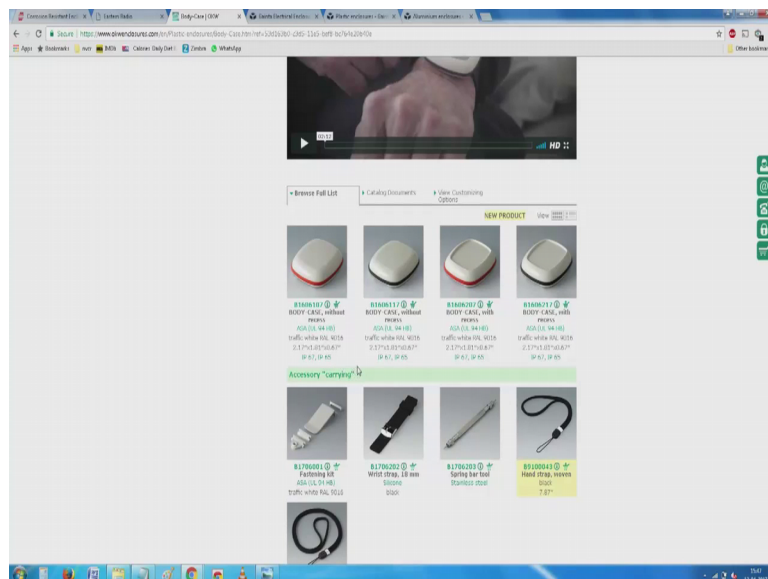
So, we have most of us know now slowly things are becoming wearable anything you want biomedical energy harvesting.

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And something to track your movement you want it is it not the more you more you think about it. So, we have absolutely you seen this know, anything you want is probably already somebody has thought about it interesting life wish it was there when I was thing know right now it is very very easy for you to try to configure make any of these thing as you want.

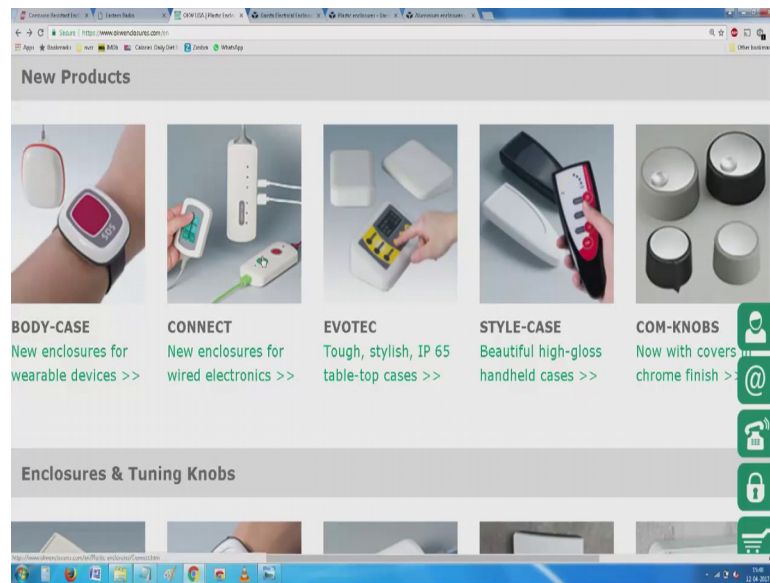
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And you see here very important thing is it continuous to by IP 65 IP 66 and not mentioned explicitly a lot of them are made with materials that are compatible with body compatible.

So, if you are to wear it, it is unlikely that you will get hurt. So, they are friendly with skin friendly and various other things and you see it is very much rounded and so on where it one level it, what can be simple industrial instrumentation.

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These all have come here to us now, we need not look for anything you want something related to variable enclosures and all the way up to fully industrial is available. I am a fan of this so called wired enclosures wish, we had this while that is very common place.

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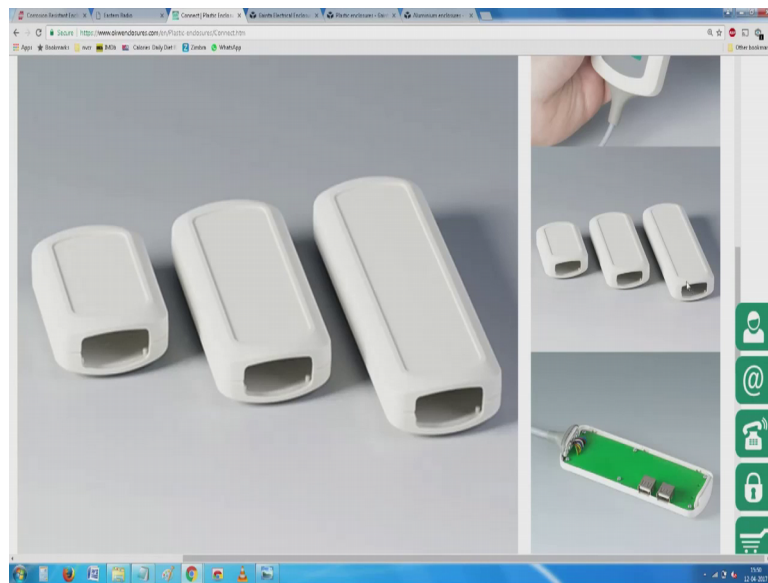


What is not very common place is this you have seen this, it is a some remote control you see at the back this seems to be part of a bed meant for hospital equipment. Only if you are ever admitted in a hospital or if you have gone and visited friends or relatives have been in a hospital, you will discover that the environment has changed and so, is the requirement of safety and shock proofness in all those places. Even the simplest bed is powered you do not have leave us somebody you can you know press up and down are you need to crank levers, instead of cranking we have various types of remote control.

So, while a wireless remote looks good a lot of times it is not as convenient as simple are I know a best solution, you can think of because ultimate what if they remote losses par and what if your what I call if it gets spoiled and what if you drop it, all this can be taken over if you have all that you need is a wired remote you have a beautiful wired remote here and because it is a general purpose thing they are just trying to show the a overlap panel in which you would like to make things more and more visible here you have seen this.

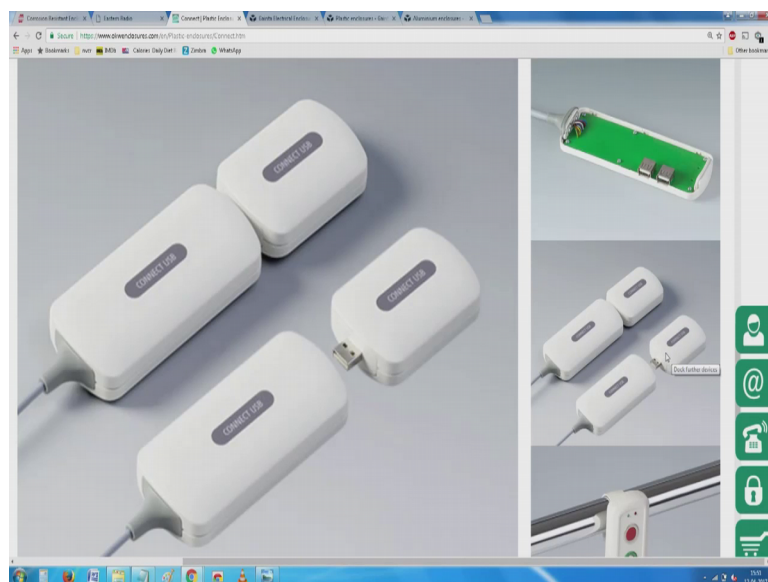
So, probably it is just that the next level, I am not yet ready for function keys and a menu operated and so on, but let us say if you are a trained technician, and or if you are doctor you have a no choice to, but you train yourself.

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Probably you will use it is your coming you see many many many many more things are ready. We already have a box whatever you are thinking about know where to usb socket equivalents are already mounted there.

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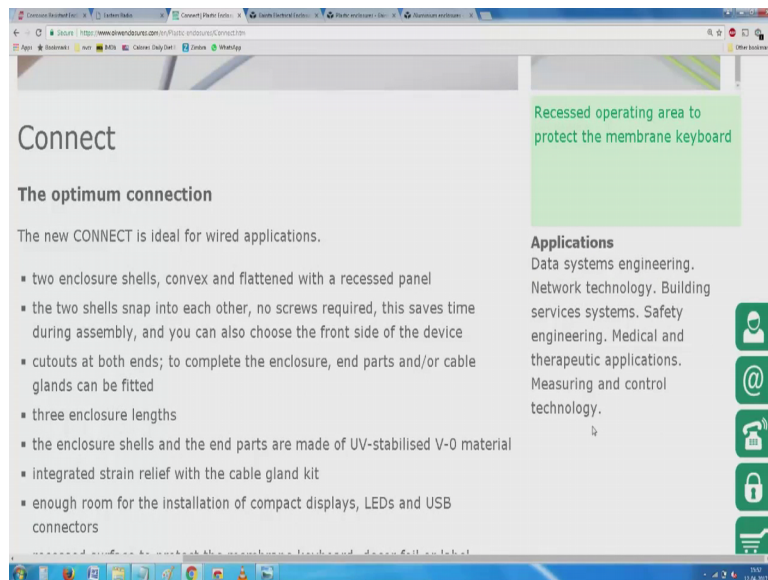
So, it is for you to go about trying to use this as much as possible and now you have a full fledge piggyback are daisy chain riding type of things. This if you are think carefully about what we saw the other place know probably it is something remote which needs to operate something and then red generally refers to an emergency stop.

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So, you think it we already have it, you seen here at the bottom most know they have given here.

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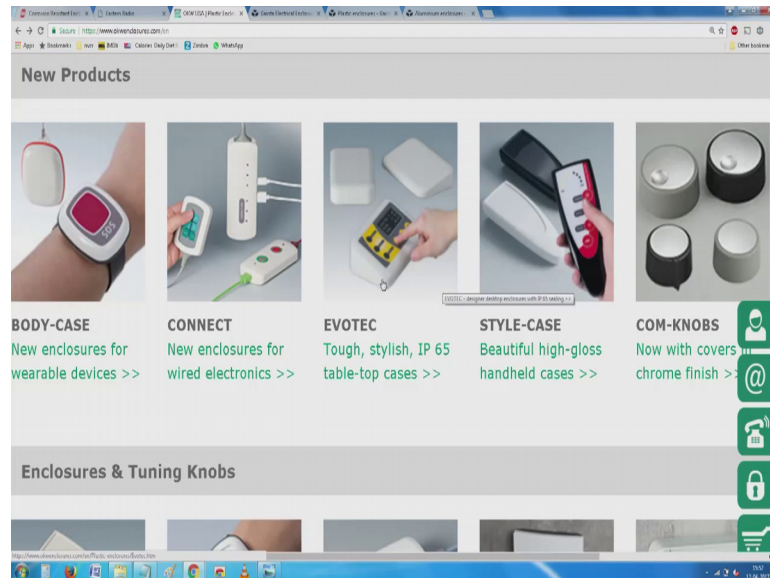


Safety engineering medical and therapeutic measuring and control technology; so we think of medical as generally only that is there in a hospital slowly several of the thing are coming home. You did not go all the way to a hospital or you may go to a smaller primary health clinic where you are has to build these things. Simplest thing I can think of a simple blood pressure monitor. Cheapest ones cost I expect around 50 dollars a good

one cost about 200 to 300 dollars and the magic thing is there absolutely repeatable safe in the unlikely case of something spilling on it nothing will happen.

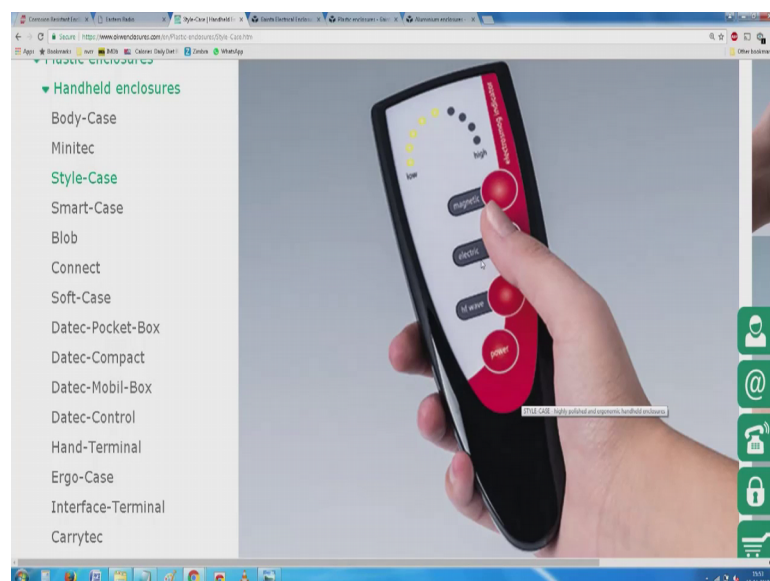
So, I am quite happy to have a take an you through these very complicated things.

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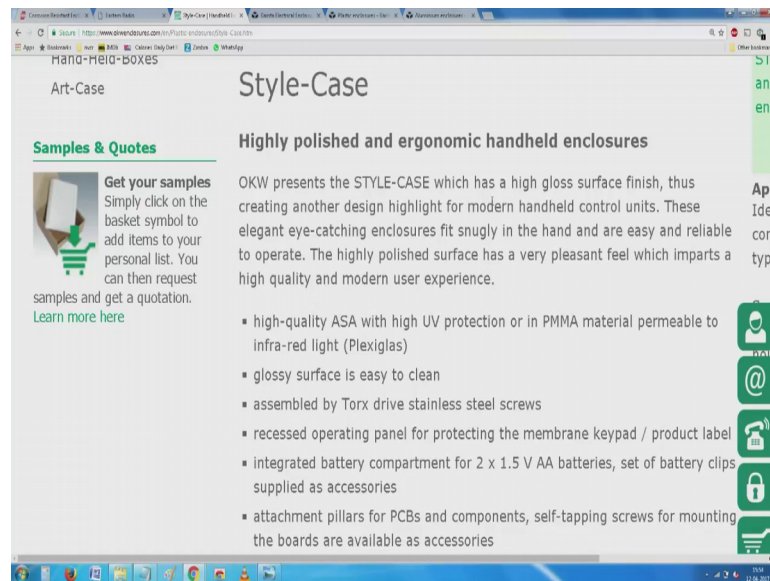
So, you seen here anything like can I table top cases handled cases with the highest things and all that not know, all that is waiting for you is for your design. So, that you can incorporate with all these things in your designs, only as a sample they have put this side do not even know.

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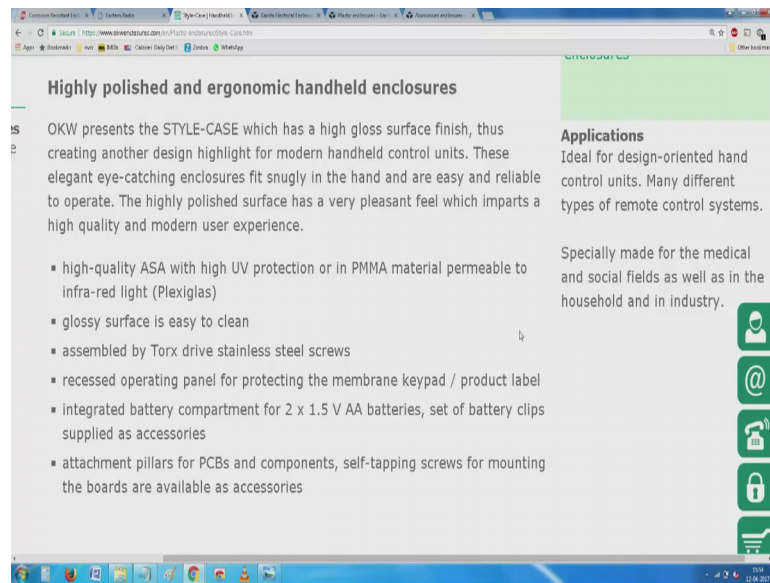
What it is there just put some magnetic electric something and I know low high and you can use it probably in some suspect natural medicine, including you know you given electric impulse here and you get better and quite different from snake oil, but not proven very well, but once you try this probably there enough people will probably buy are equipment; and we have a very large demand for grooming and people who would like to do things to their I do not know various body including know hair removers.

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And may be what removers and something which will examine your skin and I know do this for all these things, already things are available and people are ready to pay.

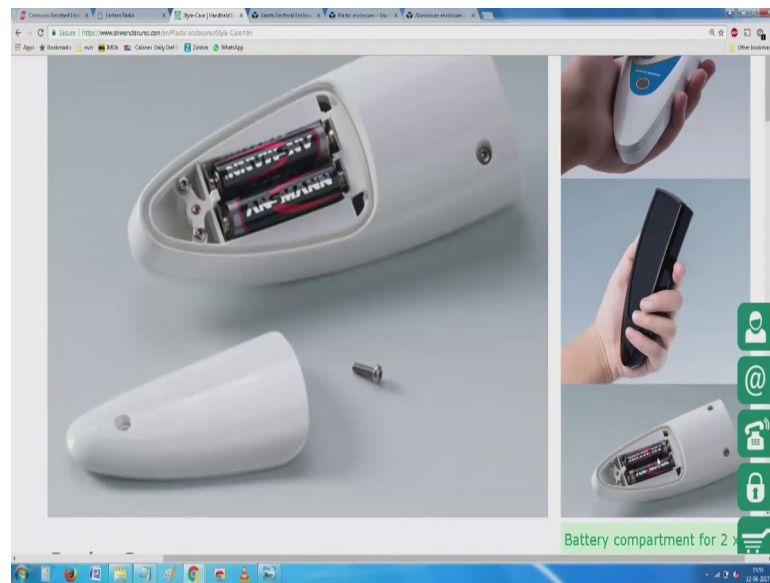
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A premium for these products unlike generic products, these things which are used for grooming starting from a maybe a bear trimmer maybe eventually an electric nail clipper and something which will polish, I do not know whether somebody is come out with it I expect that in new course something which applies and removes nail polish are attaches artificial nail art.

We have enclosures ready for it; it is for you to make things for that. You see here most of the time we have these names like PMMA; PMMA is nothing but poly methyl methacrylate, which is variant some of us know it has Plexiglas that is roman has that and an ICI I think a calls it some other name know which is there with it. Now you see inside already it comes with things which are built inside compare to some of the.

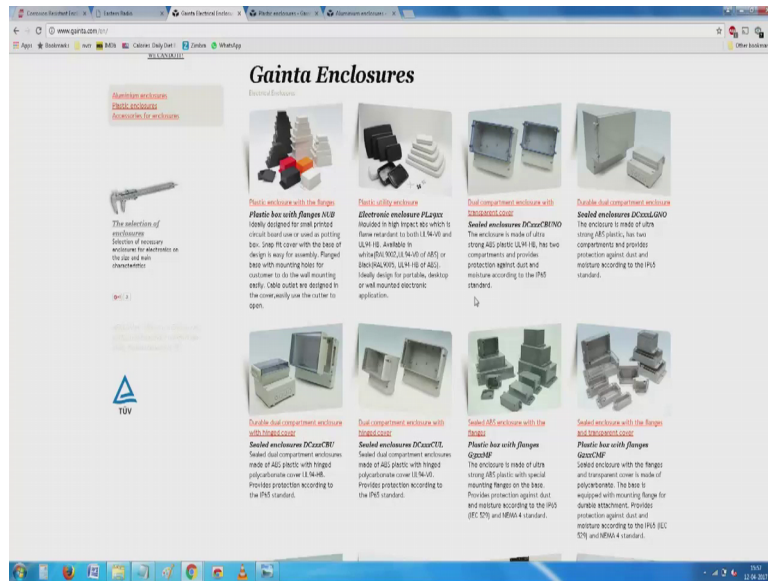
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Now very low cost things which are likely to buy for a few 100 rupees for a couple of dollars, these things are ingenerate perfectly well one is material compatibility. So, there unlikely to rust and then even if you examine the way that covers seem to sit on the battery case, it ensures that there are lipping which provides for proper grip and then you see this it definitely is ergonomic, there no sharp edges nothing is likely to hurt you and then a bit of design has been built into it. So, you have I do not know something it is showing 13.8 and 93 and 69 and so on it is just a simulation, you have them so, next time when you attempt to make anything I suggest you have a look at all this catalogues. So, you will appreciate somebody has been doing a lot of homework around these parts that you require.

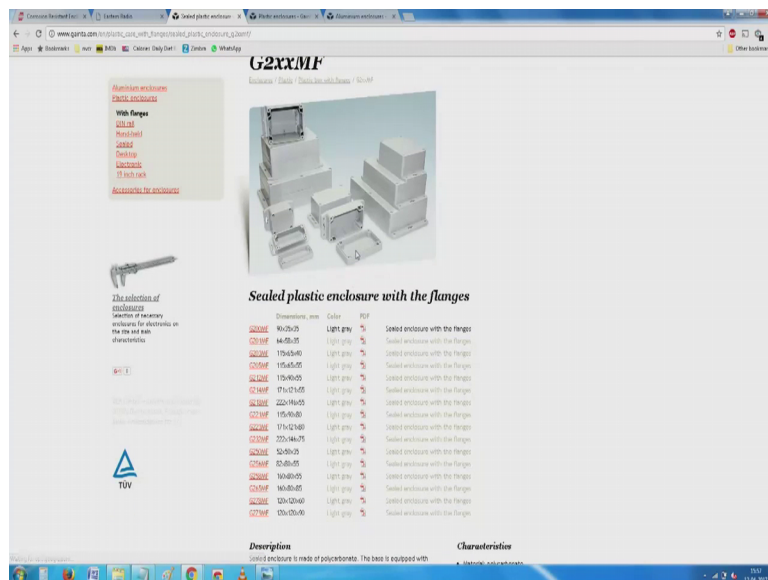
Now, I will go to something which is slowly getting nearer and nearer to what is allowed in are easier to end what we have used, are the things that come from Taiwan then a Korea china and japan and these things even.

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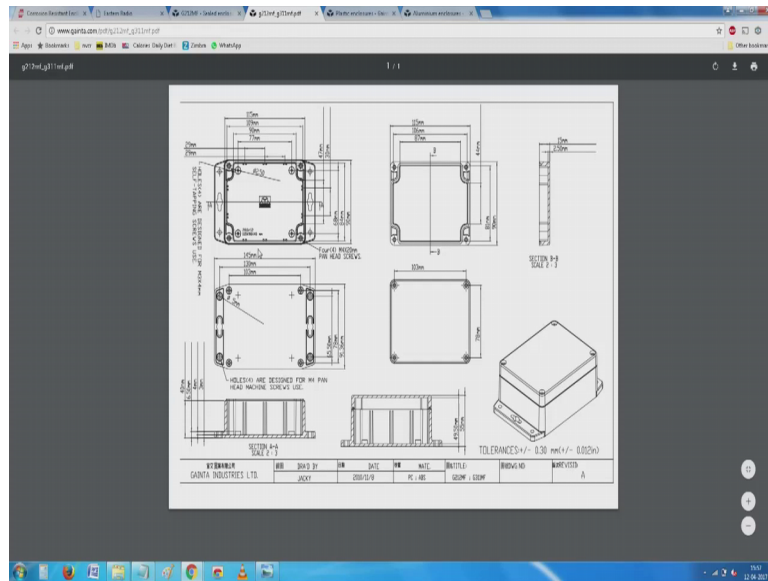
Now, (Refer Time: 12:40) the so called western world also probably there also sourced here. So, over here in India invariably we go with these things which are easily available for us.

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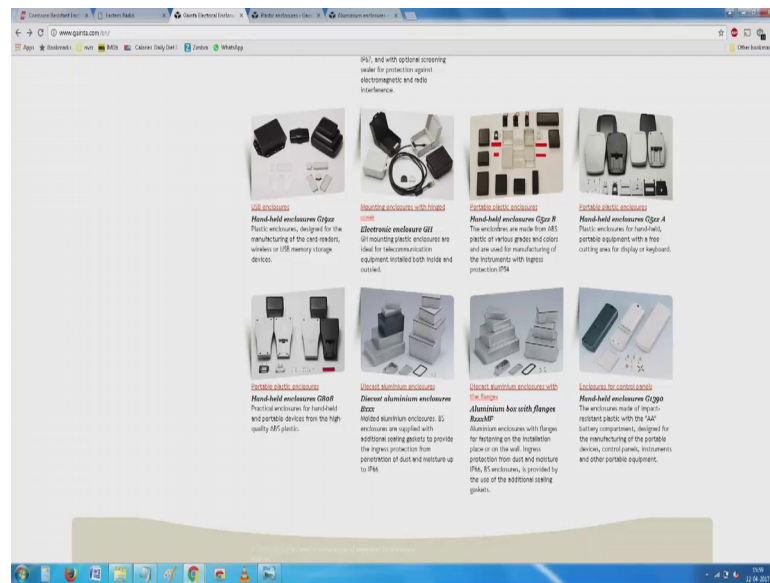
So, two of them I would like to touch upon are this you see this beautiful enclosures which have all the features like the other once plus they also come with flanges such that they can mounted, easily.

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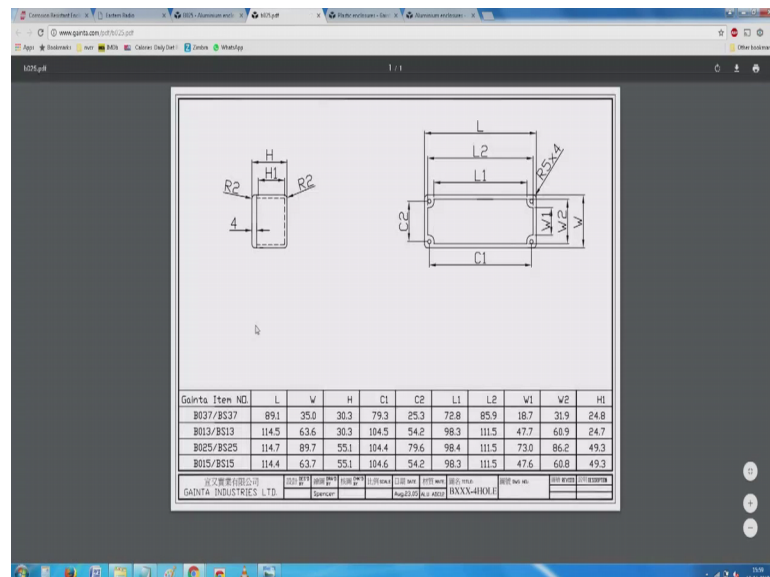
And more than anything else, application data for a packaging engineer is application data is very very critical for us. Every small detail saying what comes and top and what comes here and then if you were to make any detail to occupy this space you see here I see that I have a place of 87 mm. So, something which is 87 mm are maybe 85 mm wide by around say 80 mm can be put like this. Alternate I can have something which is a say the small thing we can have otherwise if I notch of this corners I can have a pcbv chits nicely inside some where there are also gross in the walls, I can see that things can go and sit in the gross in the walls and then all sorts of provisions of mounting the full drawings are available to us.

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So, I like this again I am not endorsing and even particular manufacturer, but I see that the easy availability of this information, and then your chances of you will be able to deal directly and then make your products ready for the market, is something which is very very positive I somehow I am.

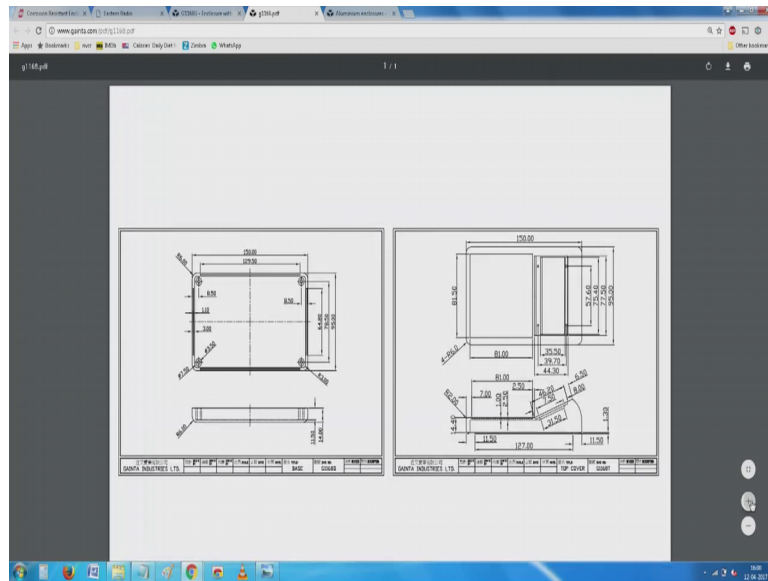
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Now, suddenly with the what a call they the new economy, where this data easy easily available.

So, all of them come with star saying there copyright. So, we cannot randomly go and start coping this thing however, this is application note and then you can always what a call depend on the suppliers for you to make wherever you want to do. So, these again one of my favorites which I have used elsewhere earlier, so I would like to show you this small enclosure see here.

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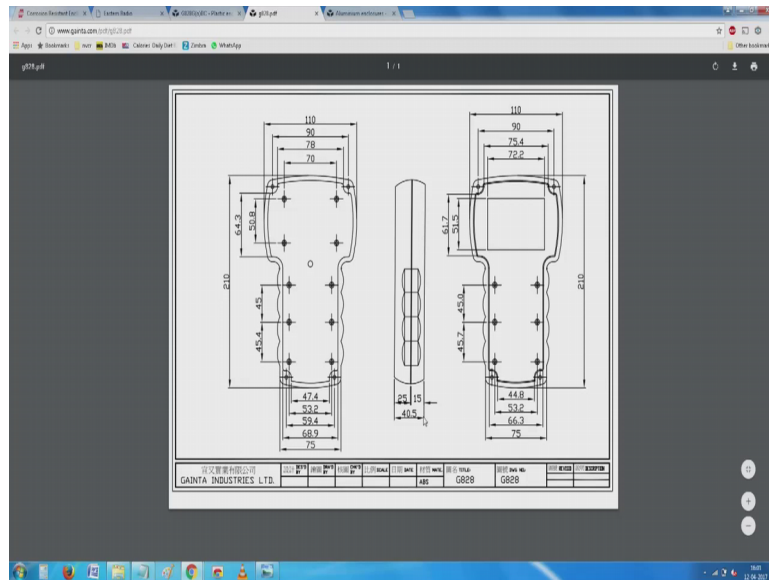
Makes life extremely easy and convenient for me here so, I have here a place for keypad which is approximately 8 mm by 8 mm keypad then I have a place here, for a small window if it is an led can be probably a transparent window or in some very rare cases special windows are available, and then the back there is enough place for us to put a 40 character to line general purpose display or a full completely accessible pixel type of a display, and such things can even be used for building anything, if you are one of the student. So, needs to we enjoys making this this is the place and then you see here.

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I have even a more beautiful enclosure which appears to be easy for me easy to hold in the one of the very earlier lectures.

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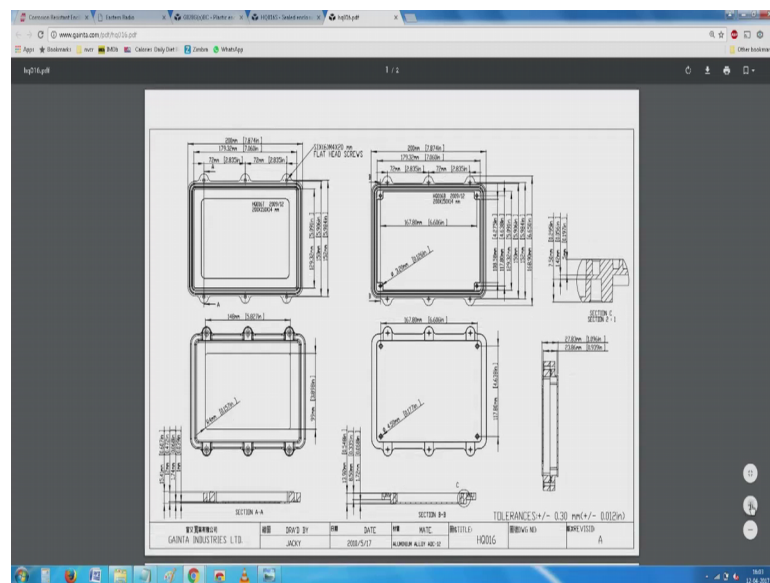


So, I showed you how to how you would hold it, how the width of it has been control how the width of it has been controlled, and in this case you have a display which is slightly wider than your grip.

So, you have already a standard enclosure for it, and if you can lay your hands are even order them online, your already in business if your one of those new startups would like

to demonstrate your capability of designing something, you can probably become an enclosure design person. So, let us say you are other people can come to you can have all this end under the total turn around cycle for the first design becomes easy. Any think you want you can just look up on the enclosures year and eventually even if it is a very very complicated design, you can have it already seen this I cannot imagine a more informative.

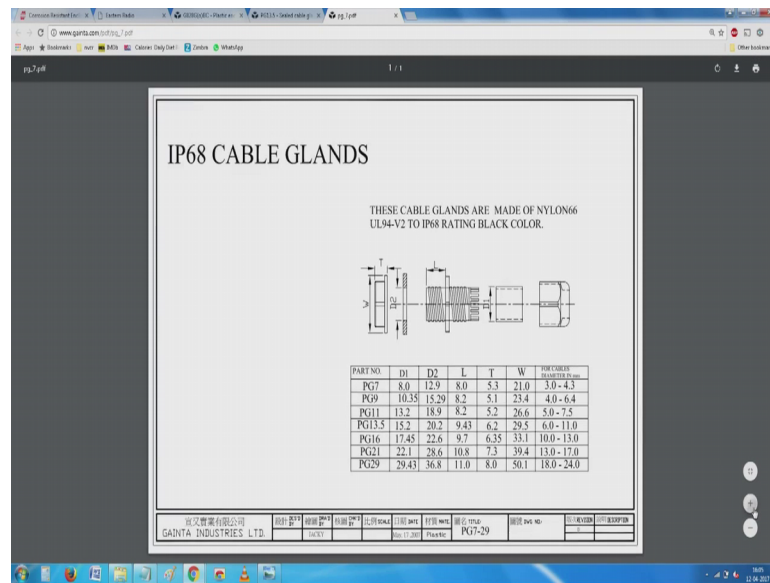
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So, it could be anything let us say you wanted to monitor energy usage in the house; saying how long a particular air conditioning has been running or how warmer how cool it feels, and then you would like to make an equipment, you just need to layer hands on one of these enclosures, put all the necessary sensors electronics everything and then the best part of it is all of them come with necessary hardware, which will make sure that input and output connections and all through various types of grommets, various types of what you call gland nuts, all these accessories are easily available with us.

So, if you click on these accessories for as enclosures you will notice at anything you can think of by way of hinges, by way of clamps and this is one of my what I will say favorites which often engineers are what you call students.

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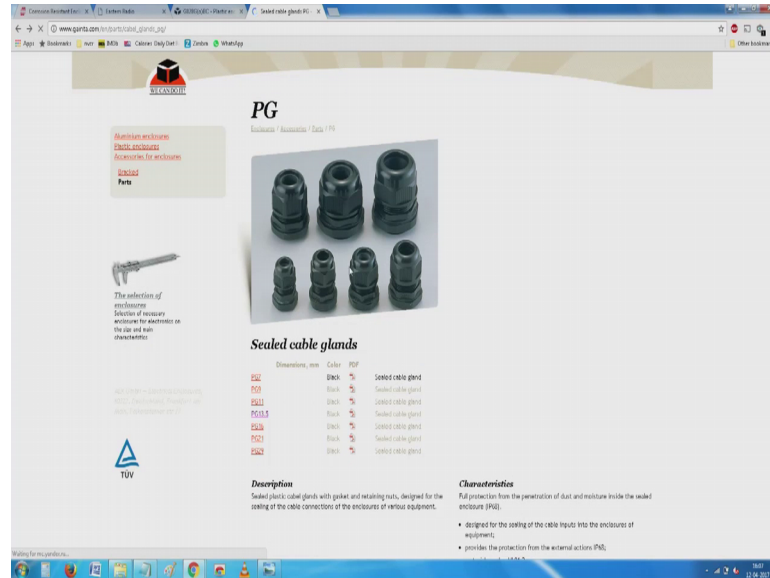
And engineers are likely to miss seen very interesting if you see a little closer at this string hey it has something there is a nut like thing here, then there is something here, then there is what (Refer Time: 20:38) here and there is something else here the whole thing is a about it is an opening to take wires in and out of here enclosure.

So, you will see that while part of the environment is very comfortable and very nice to see. Part of it is not that easily known because once it is installed and placed nobody touches it everything is fine, but the first time something is opened in try to put it by you will notice that it lead to some amount of failure, some amount of what you call missing out an few of the hardware and so on. But if you look at a place like this a gland nut cable gland any size you can think of is already available for you, and then all the necessary hardware including how to pack the gland what are the cable size that go inside and occasionally a special type of a sealing compound, it is not just arive something which is also lubricates and then it also packs it is wells and stays in play are all available.

So, even if a small thing like in your house would like to keep an outdoor light garden lights and switches for the garden lights may be a foot switch you will notice that is interesting. If you want to do you can depend on all these things and then the way they have been designed if you follow the original sequence of assembly, sequence

disassembly, and follow all the design and installation guidelines, they are design for life things work you will never have any problem relating to this.

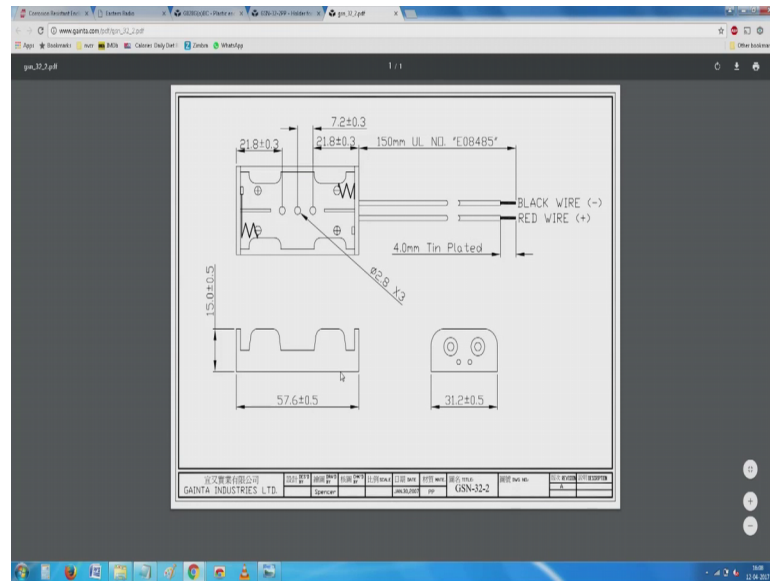
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So, I am one of the fans of all this hardware which goes with sealed enclosures you must learn to see. So, you see here what looked simple there is actually little complicated. There was a ferula light thing as you turn this nut that ferule closes and then if there is a packing inside it will go and grip the anything what you keep inside. It could be another tube, it could be a silicon slave and inside that you can have your cables and it is practically watertight.

So, one of them is this like this we have wall mounting brackets and then very really interesting I am sure you must have been looking for a all the time; a I wish I had this my hobby I would a converted into product.

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Looks very (Refer Time: 23:45) very simple a holder for two cells, but then the advantage of it is it is reliable and then you have mounting wholes and then you also have connectors or if you want taken a wires, what the doctor ordered it is a compounder the doctor used to give a generic medicines and the compounder would mix each of them and make it and make it into a something which is you know safe for you cannot buy anything of the no need to buy anything of these that nothing thicker and thicker about it.

So, we have here exactly what the doctor ordered whatever you want is already available you have seen that know this is for 2AA batteries. So, you have things which ferment for anything you can think of and then you have seen this we have a beautiful handles for these enclosures.

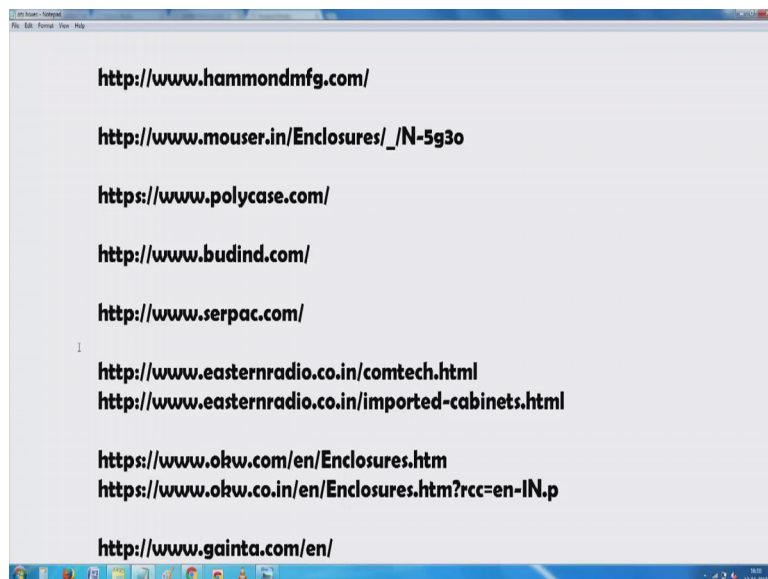
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So, if you have an idea it is very easy for you if you follow any of these what do you call enclosure systems, very quickly you can convert it into a product. So, allow me to end this lecture here and see what you will be able to take next year I am sorry in the next session. So, thank you

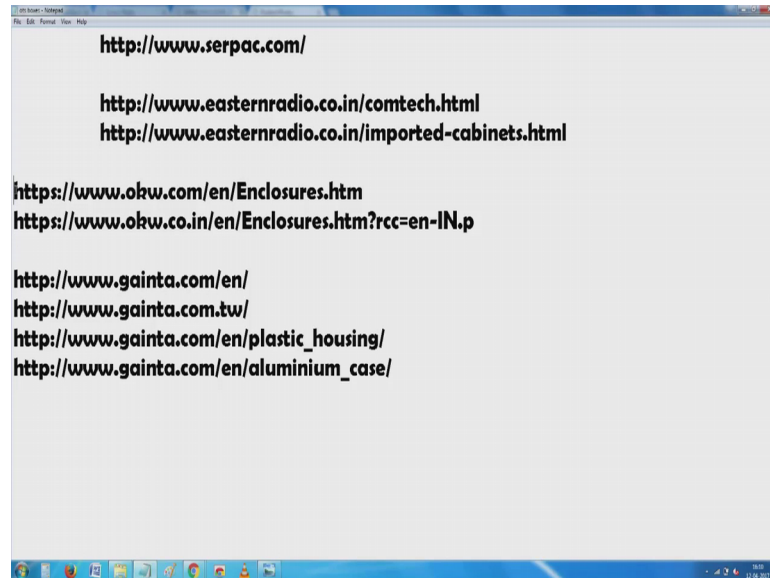
My suggestion is go back to this lecture and then somewhere I have shown you the text file, which shows you what are all the manufactures have been making these things have a look at is a text file.

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So, this text file shows you anything you can think of here. Just to go back through this file and it is just picked up randomly depending on you know what my connection could give.

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And then I have gone through in try to go along with you in detail because I have been going with this since almost the time net in these things are ready. I suggest you go through any of this end in case you have access you can give a such on using any of this search engines go through all the details, and then if you can leave them in a digital form to be useful for you.

Next is find out your local supplier and then before you start your design you should start with one of this available enclosure to see typically the aspect ratio what is the size and you will end up with a minimum of 2 a maximum of 3 iterations before your product can be made one of them can be instead of making an absolutely brand new, what you call secure to which is not very reliable you can probably end up with automatically start laying it up on a in a PCB package.

Because that old way of stringing resistors and capacitors, and all that well I would not call it obsolete it is took time consuming and I am sure your in that stage of your design profession, by which you do not need to do bred boarding anymore. If to do bred boarding for important circuit it is, but then these day you can automatically layout the circuit directly on a computer screen.

So, if you want to do it that first layout will give you only you can have a simple schematic capture and then you can the inter connections that is call the (Refer Time: 27:57) then after that when you do the actual layout of the PCB and so on if you also match it with the PDF drawings which I have shown you. Because once you have completed that bred boarding stage once you have a small circuit that is working you have some estimate of what are the very large components where the you cannot violate the footprint, and what are all the smaller components which you can afford to place them.

If you have the outline which is taken from one of the earlier PDF drawings and you can input it if you can convert it into a dxoffer igs or d double standards, most of the layout packages accept it in so, starting with a 3 by 4or 16 by 9 rectangles. On the screen and then wondering what to do you can probably start with one of these enclosures and then try to put them all put the mounting holes, and important thing is in put out put where do you mount your power supply, and all these know information is available here you can directly use one of them.

So, probably in the first iteration itself you will have a equipment which is almost about ready to work. You can hence for start concentrating on the functionality of it saying how does it work with respect to temperature, how does it work with respect to EMC and second round most likely it can go off into production and at that point you have multiple manufacturers who can start with your whatever the first these thing you have started.

And otherwise if you have taken it from the cattle log from one of the existing manufactures you can probably negotiate with them and then you are in business and doing good for the society. And somebody said while you know a lot of money has gone into making ads people would like to have a whereby which you can switch off the tv when the add is running I am still waiting for a device, which can selectively show me the ads which I want and selectively mute the ads, which I do not want I know I fortunately know I work without sponsorship. So, I such it is there.

So, thanks a lot by have a nice time it will be meat again I suggest this is probably one of the most important lectures in this series, I want you to again go back go back to the text file try to go through each of the that information I have shown. And I will see at least one or two of them can be converted into cases which you can take advantage of, so bye.

Thank you.