Design and Simulation of DC-DC converters using open source tools

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Lecture – 24
Concluding Remarks

In this course we have studied the rectifier filter. Circuit we have simulated, it we know how to design that we have looked at the wave forms and that we sorted it up with a discussion on non isolated converters, like the buck converter the boost converter the buck boost converter. We have look at the wave forms by input output relationship and also how to design and simulate them and this was followed by a discussion on isolated converters like the forward converter the fly buck converter the derived converters. The once that, where derived from the buck, the forward the push pool the half bridge full bridge and the buck boost derived converter which is the fly buck converter.

And then we discussed on the multi output converters topic and saw how we address that issue. I try to regulate all the outputs of the multi output control or multi output converter. We have also looked at trying to do PI controller for single output of the DC-DC converter, and we have also tried to look at the simulation results for our converter which is in close loop and we have actually seen two topologies; one with feed forward and one without feed forward.

And saw the theory behind these control topologies. So, I guess now that you would be reasonably sensitized to the DC-DC controller converter. Topic simulation is an excellent tool it is an excellent tool for learning. I specifically thought of introducing open source tools in this particular course because, it is something that we need to propagate and many of our students may not be having the means to pay for expensive go software. So, therefore, they should have some alternative and therefore, we choose this topic of doing everything by open source tools. Of course, in windows you have lot of tools which you can purchase and which you can definitely use like met lab spice caster and other equivalent softwares for doing all those simulation and then the design work that we went through and discussed in this course.

But the emphasis as far as this course was concerned was to do with on open source tools simulation and using this open source tools or otherwise is very good it. In fact, gives you lot of insight in to the circuit and it is a good learning platform. However, you must be careful you must understand that nothing can replace actual hardware implementation on the table that will give you the maximum insight in to the circuit. So, gradually I will recommend and suggest that you should go more and more towards implementing on a lack table.

There are lot of issues that even a simulation will not be able to take into account and, the results that you will give that you will get or kind of clinical and doctor. So, therefore, I will say; for example, d e m I issues in the hardware, in the actual hardware that are lot of small issue, small things like layout and routing there will be a small circuit which is in a loop and then, there will be a current flowing through that loop and because the current flowing through that loop. There will be an electromagnetic radiation because the loop will act like an antenna and then this can couple in to a neighboring circuit and this issue is very difficult to show on simulation or get reflected on a simulation because the models may not be there.

And it is highly dependent on other parameters like layout and routing issues. Therefore, you should have consider all these things and have these things in mind. When you are doing simulation and try to use the simulation with the pinch of salt in the sense that the results that you get from the simulation will consolidate your concepts it will say your design is right it can handle. So, much current this particular device can handle. So, much voltage can which stands for much voltage and this is the path for prevailing is the path in which the current will take for a particular circuit in a particular time instant of time, all these concepts can be consolidated and understood and great insides can be go in this.

But the actual working during implementing in the hardware you will get lot of other issues and disturbances and uncertainties. Which you would not have imagined of like as I mentioned the e m i and the e m c issues. There could we wiring issues there could be component layout issues there could be choice the component itself, there could be

handling of the gate, there will be protection issues voltage protection issues current protection issues integration of all these things.

So, many such small, small things will add up and then they can become a major significant problem and more and more as you start doing on the lack table, you will start getting more and more experience. And it is like an artist the though we say all these design is very systematic and has engineering precision in a when you implement. There is some element of art which comes in to it. So, it is not only engineering and science it is also art when you are implementing the circuit's making b c b layouts and trying to get the results out of that.

I hope that you have learnt something from this course and I hope that your sensitized to DC-DC converters both non isolated and isolated and you now, how to go about simulating the circuit using open source tools and that would be the take away from this particular course the method of getting inside and do a circuit input, output relationship and the way you would go about simulating the circuit using this, has a base you should properly look at more literature and try to understand more. The play in to the other topologies and much more different topologies which are available in the literature and papers and the try to study the open out, open a particular broken or damaged piece of SMPS; open them out and try to study what goes inside and things like that one.

That way you can try to investigate and get more insights and to the DC-DC converters. Another in a very, very important aspect that I have very briefly touched and sensitized you, but not gone into very great depth is the part of magnetic. Magnetics is very crucial both the inductor magnetic and the transform transformer magnetic and both these both the electrical and the magnetic design is actually very pivotal to the proper working of DC-DC converters and you have to master this art of designing the transformers and inductors and more and more. You wind transformers more and more you take different types of codes put them together and then, physically wind it with your hand and then insert clear gaps and then check the inductance values keep doing that. Then you will get more confidence it building the magnetic.

Because in most of the power electronics most the DC-DC converters. The central figure, the central component is not the not only the power semi connector device. But more; in fact, the magnetic components that is the transformers and the inductor. So, you have to pay lot of attention to the art and try to see if you and a scale a scale up your skills in trying to make the transformers and these inductors, so we that I will close this topic this course and probably meet you in future again and some other course.

Thank you.