Ticket #852

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Create Date:	03/18/2015 9:48 pm	**Phone:**	(713) 501-2744
Field of Study:	Electrical Engineering		

Subject: **0-Not Registered**
03/18/2015 9:48 pm Philip Piper

Hey from Bulldogs Racing! Although we aren't competing this year, we are still trying to get a leg up for the 2016 competition.

A1.2.2 states that the maximum accumulator capacity must be computed at a 2C discharge rate. Additionally Appendix A gives Peukert's Equation to adjust for an energy capacity found at a different rate than 2C. A battery manufacturer that we are thinking of using for 2016 provides a graph plotting cell voltage (V) vs. discharge capacity (Ah) at 2C. Additionally they provide a nominal capacity at 0.308C. Can we integrate the graph using a suitably fine Riemann sum (say 1Ah intervals) rather than using Peukert's Equation to adjust the given 0.308C capacity? It seems to us that directly integrating the manufacturer's data may be easier and more accurate than determining the Peukert number when the 2C curve is given. I have attached the graph in question for reference.

Also I noticed that Appendix A shows Energy(Wh) = (Vnom)(Ah)(0.8). However only the Hybrid sections IC2.1.3 and D7.6.3 reference Appendix A. Is the 0.8 factor only relevant for hybrid accumulators, or does it also apply to electric-only vehicles' accumulators.

One last question. How susceptible to change is the maximum accumulator capacity for electric-only vehicles between the 2015 and 2016 competitions? If I remember correctly this value changed between 2013 and 2014, but not between 2014 and 2015. We have started researching potential cells, but want to hold off on any purchases until we know our limitations, even if that means waiting until July or August.

Thanks for your time!
Cell Voltage vs Discharge Capacity.pdf*(82.4 kb)*

03/22/2015 2:07 pm

Hello Bulldogs!
In that the manufacturer gives you a 2C curve, you just have to pick an end voltage, preferably the same as your BMS shutdown setting (e.g. 2.2V) and read the Ah value.
You only need to invoke Mr Peukert's equation if the the required 2C data is not given.
For example, if you were given 1C and 5C, you could use Peukert to calculate a value for 2C.
We look forward to seeing some of your team at this year's event.
Feel free to visit us in electrical tech inspection and ask all the questions that you want (when we are not too busy..).
Rob Wills
Chief Electrical Inspector

03/22/2015 3:39 pm Philip Piper

Hi Rob,

We are planning on bringing some of the team to this year's competition for a couple of days. It will be nice to talk with some of the other teams seeing as we were so focused on our car last year.

It seems like we would use a value of 20Ah then in conjunction with the nominal cell voltage of 3.3V (rather than the

maximum cell voltage of 3.65V) to calculate the energy capacity of our pack.

Any words on the last two questions about Appendix A and changes to maximum accumulator capacity?

Philip Piper

03/23/2015 12:14 pm

The max accumulator capacity Rule A1.2.2 has been constant at 4449 Wh for hybrid and 5400 Wh for electric has remained constant back to at least 2011. We do not plan to change it for 2016,
but it might be prudent to wait till the 2016 rules come out before purchasing.
The way LiIon battery pricing is going, you may get a better price by waiting a while also.
Regards -
Rob Wills
Chief Electrical Inspector

03/25/2015 8:39 pm Philip Piper

Hi Rob,

Anything about Appendix A and how it applies to hybrid vs. electric teams? I've copied the question below:

"Also I noticed that Appendix A shows Energy(Wh) = (Vnom)(Ah)(0.8). However only the Hybrid sections IC2.1.3 and D7.6.3 reference Appendix A. Is the 0.8 factor only relevant for hybrid accumulators, or does it also apply to electric-only vehicles' accumulators."

Thanks again for your time,

Philip Piper

04/05/2015 10:41 pm

The formula "Energy(Wh) = (Vnom)(Ah)(0.8)" should be used for both hybrid and electric-only.
This will be clarified in the 2016 rules.
Thanks for picking this up!
Rob Wills
Chief Electrical Inspector
(will be closed post-discussion Monday)

Please Wait!

Please wait... it will take a second!