Level Reduction Technique for Multilevel dc-dc Converters, Used To Produce a Controllable dc Voltage, Developed

A level reduction technique for multilevel dc-dc converters, Figure 1, to be used to produce a controllable dc voltage has been analyzed, developed, and simulated.

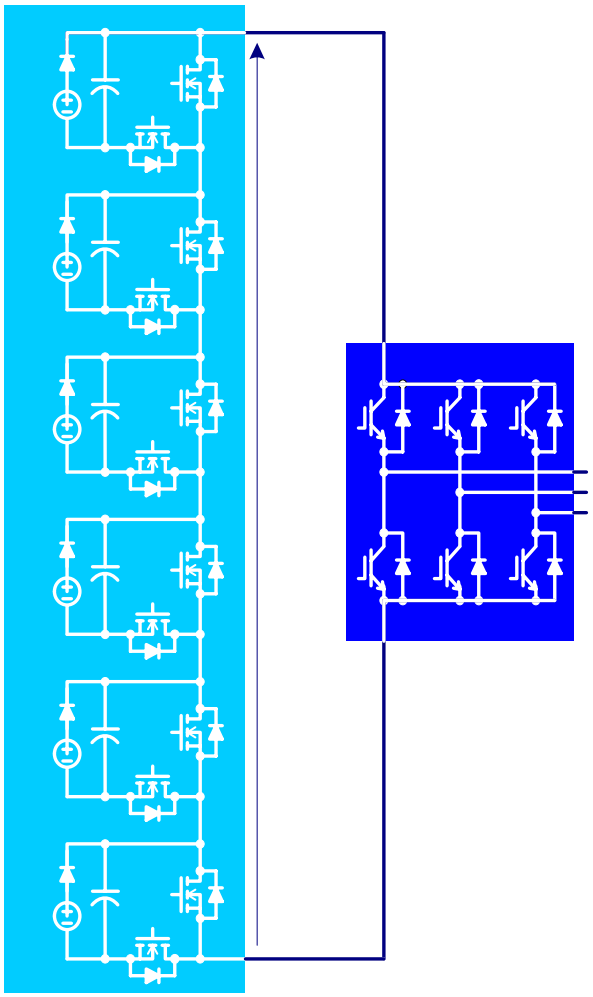

Figure 1: Multilevel dc link converter.

This multilevel dc-dc inverter has all the advantages of the cascaded multilevel inverter but with fewer switches.

As an example of its operation, assume that we are trying to obtain 220V rms at the output of the inverter then, we need the dc-link to be constant at 396V as shown with the red line on the red figure.

If the fuel cells are connected in series to produce the dc-link voltage without a dc/dc voltage regulator, then the black line in Figure 2 shows the variation of the dc-link voltage with load current. At no load, the fuel-cell supplies almost 50% more than the

required dc-link voltage. The problem in this case, is that even if the inverter is operating at rated load most of the time, the power switches of the inverter should be overrated taking the no-load case into consideration.

The level reduction technique inhibits certain number of fuel cells so that the dc-link voltage is always closer to the required dc-link voltage. The blue line on the left plot shows the variation of the dc-link voltage when level reduction technique is used. At full-load, nine fuel-cells are required to produce 396V, but at no-load only six will be enough. The inverter switches, in this case, will have lower ratings.

Another advantage of this technique is that when the fuel cells are inhibited, they can be used in other purposes, such as charging batteries.

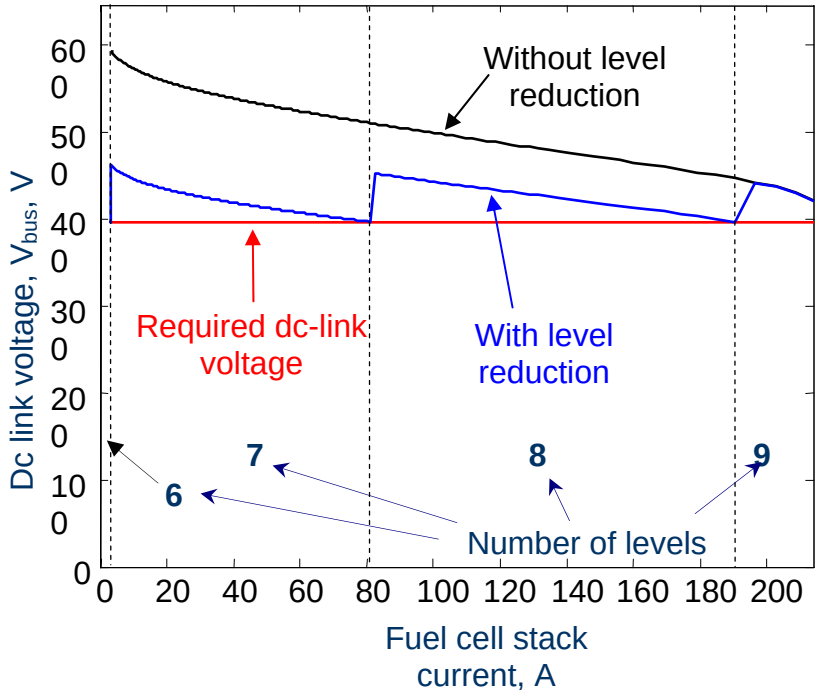

Figure 2: Dc-link voltage versus load current for 220V output at m = 0.785.

Read more about this work.