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VRLA vs Hybrid Supercapacitor – Performance, Energy and Power Density

The 12V, 1.587kWh Group 31 hybrid supercap has 12,560 cubic centimeters volume in the case although the cells probably take up less than 50% of the case volume (I have opened one up). 1587 Wh / 12,560 cm3 / 50% = **0.25272 Wh/cm3 module Volumetric Density.** This is its approximate Volumetric Density. The **HSC Mass Density is 1587Wh/20kg = 79 Wh/kg.**

The individual 31Ah HSC cell is 3.2V nominal so provides 99.2Wh at a weight of 0.650kg. This is a cell mass density of 170Wh/kg. Volume is 1.1cm x 31cm x 10.3cm = 351.23 cm3 . 99.2Wh / 351.23 = 0.2824 Wh/cm3 cell Volumetric Density.

With capability to deliver 100% DoD, the useable density is equal to the volumetric or mass density, whichever you prefer. 20,000 cycle-life.

For comparison, a Deka Group 31 lead acid AGM battery is rated at 47.5Ah for a capacity of 570Wh. (47.5 x 12v). It's volumetric density, assuming the same Group 31 dimensions is 570Wh / 12560 cm3 = 0.0454 Wh/ cm3, at 100% DoD. The cells and electrolyte probably take up 90% of the case volume. So 0.0454 / 0.9 = 0.050 Wh/ cm3. But they cannot deliver 100% DoD without complete failure in under 20 cycles. So at 50% DoD, which would cut cycle life to less than 100 cycles, the **AGM useable Volumetric Density drops to 0.0227 Wh/ cm3.**

With a mass of 32.4kg, the Mass Density of a Deka VRLA is 570 / 32.4 = 17.59 Wh/kg. Useable **AGM Mass Density is 8.79 Wh/kg.**

- Our useable **Volumetric Density is 11x greater than a VRLA.** (0.2527 / 0.0227)
- Our **Mass Density is 9x greater than a VRLA.** (79 / 8.79)
- Our **Cycle Life is 40x greater than a VRLA.** (20,000 / 500

This will vary somewhat depending on the VRLA selected.

Considering all metrics, but particularly cycle-life, there is no comparison of performance between a VRLA and an HSC.