

ACT: Calorimeter “Pan of Water”

7-20-12

This most basic of all energy balance tests simply boiled a measured quantity of water from room temperature to the boiling point. A small amount was evaporated which took more energy from the system, and this was accounted for. The test only took 6 minutes and the open flame from the HHO generator (DZ unit) was abundant and beyond what was probably needed. **This test is simple, easily measured, and reasonably accurate.**

- Fill mass: 7570g of water (2.0 gallons)
- Tare weight: (pan + thermometer) 2425g
- Gross weight filled: 9995g
- Final weight: 9770g (= 225g loss from evaporation)
- **Feed water converted to HHO: 180g (= 20g of H₂). This happened in 6 min which means the rate of H₂ generation was 200g/hr (0.2kg/hr) or 3.33g/min.**
- **Total power to run the system netted out at 770W (0.77kw). The trial ran 6 min (0.10 hr) so only 0.077kwh were used to run the DZ unit. This converts to 262.8 BTU (in 6 min).**
- **The HHO flame raised 7570g of water by 61° C which requires 461,770 calories (= 1832 BTU). This is equivalent to 16.1g of H₂. This compares well with the theoretical 20g from the measured feed water.**
- **The conversion efficiency, at a minimum, is 1832 BTU/ 263 BTU = 7.0X !! If we allow for the 225g evaporated, this value climbs.**
- **The “EOM” (energy output multiple) is probably closer to 20X. The stainless steel pan had poor heat transfer and a lot of the flame rose up around the sides of the pan. Assuming 40% efficiency of net heat transfer from the flame to the water is conservative: 40% creates a 2.5 multiplier on the previous 7.0X factor. This takes us up to an output of about 1.5kwh (5130 BTU), or about 40g/6 min of H₂. This is 0.4kg per hr, which is very characteristic of much of the previously reported DZ output data.**

Boiling Behavior: Ideal

The temperature curve over the 6 min is a classic textbook shape. It starts out very linear up to 3 min (163 F) and then begins to slow down. The heat gains from zero to min 3 averaged 21 degrees/min. At minute 4 it was 15 degrees; at min 5 it was 10 degrees and at minute 6 it was 10 degrees. This is simple heat transfer physics. The delta temperature gradient kept dropping as the water temperature increased, so the rate of heat transfer had to decrease. In addition, 225g of water evaporated in the last few minutes, further removing heat from the system.