Test of Energy Catalyzer

Bologna April 19, 2011

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**Measured voltage:** 236 V (AC)

**Weight hydrogen bottle** (attached, opened, closed, and detached):
- before: 13653.1 grams
- after: 13652.6 grams
Total loaded: 0.5 grams

**Pressure H2**
Bottle: 85 bar
Reduced: 12 bar

**Temperature**

T2 – temperature water inlet
T3 – temperature outlet

17.03 Water pump started.
17.07 Water comes out of outlet hose.
17.10 Water inlet from reservoir 2 – initial weight 10280.7 grams
17.12 Start control unit.
  Measured AC current: 153 mA, which means 36 watts
17.15 Start heating
  Measured AC current: 1.5 A, which means 354 watts
  T2: 20.9°C  T3: 21.3°C
17.21 Sound of heating water. T3: 67°C
17.25 T=99.9 °C. Outlet hose hot.
17.31 Change reservoir to 1
  Reservoir 1: initial weight 10185.9 grams
  Reservoir 2: 8826.6 grams (consumed 1454.1 grams in 21 minutes, which means 4.15 kg/h).
  T2: 22.8°C  T3: 100.0°C
18.25 Added water from reservoir 2 into 1
  B before: 8826.4 grams  T2: 22.6°C
  B after: 6001.6 grams  T2: 22.1°C
  Tot added: 2824.8 grams
19.07 Added water from reservoir 2 into 1
  B before: 6001.0 grams  T2: 22.0°C
  B after: 2195.2 grams  T2: 21.6°C
  Tot added: 3805.8 grams
19.41 Stop. Reservoir 1: 7891.7 grams  T2: 21.6°C
Water flow

Reservoir 1

Weight at start 17.31 + 10185.9 grams
Added 18.25 + 2824.8 grams
Added 19.07 + 3805.8 grams
Remaining 19.41 – 7891.7 grams

Tot consumed in 2:10 h 8924.8 grams, which means 4.12 kg/h

Energy calculation:

Conservative value of inlet water temperature, T2: 22.5°C
Boiling temperature: 99.5°C
ΔT = 77 K

Heat capacity of water is 4.18 kJ/(kg x K)

Energy required for heating water, \( W_{\text{heat}} = 321.86 \text{ kJ/kg} = 89.41 \text{ Wh/kg} \)

Enthalpy of vaporization is 2260 kJ/kg. Energy required for vaporization, \( W_{\text{vap}} = 627.8 \text{ Wh/kg} \).

Total energy required, \( W_{\text{tot}} = W_{\text{heat}} + W_{\text{vap}} = 717.2 \text{ Wh/kg} \)

Total mass of water, \( m_{\text{tot}} = 8924.8 \text{ grams} \)

Total energy produced \( W_{\text{tot}} \times m_{\text{tot}} = 717.2 \times 8.9248 = 6401 \text{ Wh} \)

Max electric heating energy (including 36 watts power for control unit):
354 x 2.167 = 767 Wh

Net energy: 5634 Wh ≈ 5.6 kWh (≈ 20 MJ)

Average net heating power in 2:10 (2.167) h: 5.634 / 2.167 = 2.6 kW
Temperature during start-up:

![Graph showing temperature over time]

**Instruments**

* Peristaltic pump NSF
  Model # CEP183-362N3
  Serial # 060550065
  Max output 12.0 liters/h
  Max press 1.50 bar

* Temperature logger Testo
  177-T3
  0554 1765 Usb Interface

* Temperature probe Testo
  Calibration certificate No 838/2010 PD 29/12 2010 (measured T3)
  Calibration certificate No 839/2010 PD 29/12 2010 (measured T2)

* Radiation meter Automess
  S/N 95171

* Scale
  Model: TKW 15 S
  S/N: 2917029003
  Max 15000 g
  d= 0.1 g
  Certified according to ISO 9001:2000

* Amperemeter Digimaster DM201
  1090647637
  (Checked against a multimeter afterwards by Mats Lewan).

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*Report by Mats Lewan – mats.lewan@nyteknik.se, April 29, 2011.*