

NewEnergyTimes reporting from Bologna

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I think Steven Krivit's video from his visit to Bologna is very revealing. In reference (1c) one can see a little puff of mist at the end of the tube. If we had invisible steam rushing out of the tube at a speed of 11 m/s (Calculation 1 below), the puff of mist would certainly be blown away quickly!

The E-Cat runs on 5 kW power. So what *we can see coming out of the tube is the total production of E-Cat running at 5 kW!* This little trickle is hardly useful for heating or producing electricity! Note that losses in the tube are small according to Rossi (1a) and that all water is converted into dry steam (Calculation 2).

Where does the power go? Out of the E-Cat or the tube? Not very likely since the losses are small, 5 kW is a lot of power and it would heat the room perceptibly. The only remaining explanation is *that the E-Cat does not produce excess energy.* The input electrical power is $3.5 \times 220 = 770$ W (2b). It takes 608 W to heat 7 kg of water in an hour from 25 to 100°C (Calculation 2). The remaining $770 - 608 = 162$ W is used to evaporate a small fraction of the water. Since the temperature of the output water is not actually measured, it is quite possible that the temperature is less than 100°C, which would leave some additional power to evaporate water.

So, where is the water then? It should be trickling out of the tube. When Rossi removed the end piece of the tube, he very deliberately emptied a fair portion of the tube from water, and subsequently held the end above the level of the rest of the tube (1b). It would take a significant time for the tube to be filled with water and the water would trickle out (Calculation 3).

Calculations

1 Speed of steam out of the tube

Molar volume: http://en.wikipedia.org/wiki/Molar_volume

Gas law: $pV = nRT \rightarrow V = nRT/p$

Molar volume at 0°C is 22.4 liter/mole

Molar volume at 100°C becomes (note conversion to K) $22.4 \times 373/273 = 30.6$ liter/mole.

We want to completely evaporate 7 kg of water in an hour (1d). This is

$7 \times 1000/3600 = 1.9$ g/s.

The number of moles is given by

$$m/M = 1.9/(16+2) = 0.11 \text{ moles of water vapor/s.}$$

This water vapor has the volume

$$0.11 * 30.6 = 3.4 \text{ liter} = 3.4 \text{ dm}^3 = 3400 \text{ cm}^3.$$

Let us assume that the inner radius of the tube is 1 cm (outer diameter with a wall thickness of 0.5 cm becomes $2*(1+0.5) = 3 \text{ cm}$).

$$\text{The cross sectional area is } \pi*(1^2) = 3.14 \text{ cm}^2.$$

The length of the column of steam that must pass the cross sectional area per second (i.e. the velocity v) then becomes

$$v = (3400 \text{ cm}^3/\text{s})/(3.14 \text{ cm}^2) = 1080 \text{ cm/s} = 10.8 \text{ m/s.}$$

2 Average power calculation

In the "Rossi Calculates" video Rossi states that the E-Cat uses 7 kg of water per hour. The energy needed to evaporate 1 kg of water is

$$74.8 * 4180 + 2260000 = 2570000 \text{ J} = 2570 \text{ kJ}$$

The temperature difference of 74.8°C is from (2a).

The power is

$$7 * 2570 \text{ kJ/h} = 18000 \text{ kJ/h} = 18000/3600 \text{ kJ/s} = 5.0 \text{ kJ/s} = 5.0 \text{ kW.}$$

If no steam is produced the power becomes

$$7 * 74.8 * 4180 \text{ J/h} = 2190000 \text{ J/h} = 608 \text{ W.}$$

3 Water level

The water level would rise by

$$(1.9 \text{ cm}^3/\text{s})/(3.14 \text{ cm}^2) = 0.6 \text{ cm/s} = 0.36 \text{ m/minute}$$

References

- 1 Krivit's video: <http://www.youtube.com/watch?v=m-8QdVwY98E>
 - a "very small condensation": 10.40 (minutes.seconds)
 - b The tube trick: 11.00
 - c Steam against T-shirt: 11.30
 - d "In this moment we are making 7 kilograms of water per hour": 12.15
- 2 Rossi Calculates: <http://www.youtube.com/watch?v=YrTz5Bq6dsA>
 - a Temperature difference: 3.35
 - b Ampère meter: 09.20
- 3 Rossi's response: <http://www.journal-of-nuclear-physics.com/?p=497>

Addendum 2011-06-29

It is claimed by Rossi that 100% of the water is evaporated. In a Response to this document (reference 3) he claims that the losses through the tube are 5.4 kW. Since the total output power is 5.0 kW, the thermal efficiency is negative. A very strange machine! Rossi claims that the losses are due to radiative losses from the tube. Let's use the Stephan-Boltzmann law to calculate the radiative power if the tube radiates as a blackbody (maximum radiation).

$$P = 5.67 \cdot 10^{-8} * (358)^4 = 931 \text{ W/m}^2 = 0.0931 \text{ W/cm}^2$$

The temperature was taken as $85^\circ\text{C} = 358 \text{ K}$.

The result is far less than the value 1 W/cm^2 claimed by Rossi. Either Rossi is wrong about radiation losses or he has discovered a new radiation law!

The obvious explanation is, of course, that the E-Cat produces no excess energy, and hence the limited power at the end of the tube!

The above result becomes even more striking if the tube does not behave as a blackbody (it doesn't) and if one also considers radiation from the room.

Of course, everyone knows that the main energy loss in normal circumstances is by convection. It is, even so, inconceivable that the total loss from the tube is much more than 500 W. This would, if the E-Cat produces 5 kW, leave plenty of energy to be dissipated at the end of the tube. We see nothing of this in the video (reference 1).

Addendum 2011-06-30

It has been questioned what is meant by "Since the temperature of the output water is not actually measured, it is quite possible that the temperature is less than 100°C".

First, this is of course only speculation. Depending on the construction of the water cooling system it may be possible that some water escapes into the drainage tube before it has reached 100 °C (uneven heating of the input water). In that case, it is argued, there would be more power to evaporate more water.

This is not a very important part of my reasoning – the 162 W above is enough to produce some steam, definitely an amount consistent with what one can see in the video.

Addendum 2011-07-01

Here is a still picture of the end of the tube. Near the end of the hose the steam is invisible, but within a few centimeters it is virtually stopped and becomes visible because of condensation. It is hard to imagine that the steam comes out with a speed in excess of 10 m/s! According to Calculation 1 above the volume/s of dry steam coming out should be 3.4 l/s. This is definitely not what we are seeing!

2011 - Andrea Rossi Explains His Energy Catalyzer

StevenKrivit 135 videoklipp

