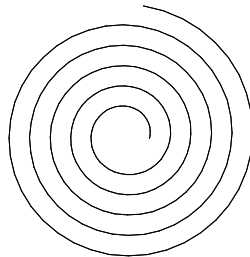
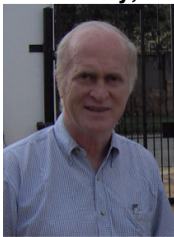


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EX SPIRA AQUA MUNDA

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Presentation

The E-Cat and the Hot-Cat basically are the same device;  
the difference between them depends from the manner in which the  
Energy as substance is coming out of them.

In the case of the E-Cat inside a coiled pipe wrapped around the  
reactor (at +/-1173°K) and acting as a cooler, a stable flow of water  
coming from the surrounding is pumped at a fast enough flow in order to  
maintain its output temperature at ~100°C or ~373°K

In the case of the Hot-Cat, instead, a stable flow of Water pumped  
inside the cooler pipe will have to remain around the reactor in order to  
change its status of existence and come out of a nozzle as a flow of  
Water Vapor moving a turbine to which is connected an electric  
generator.

## Comments about future use of the E-Cat and of the Hot-Cat

### The E-Cat and the Hot-Cat as two embodiments of the same device

The scientific community, up to now explained what takes place inside the E-Cat reactor as a phenomenon inducing a Low Energy Nuclear Reaction (LENR) affecting the atomic entities belonging to it, in effects the argument is a lot more complex since presently a reaction involving the atomic nuclei has been always of a magnitude far greater than that involving the E-Cat.

I would say that the reaction/s taking place in the E-Cat, though many times bigger than an ordinary exothermic chemical reaction, are smaller by far than the atomic reactions involving the atom's nucleus to which presently we refer when we consider the nuclear plants.

I think that at present when we refer to the E-Cat we have to consider that the reactions happening inside it are involving processes similar to the chemical ones which being far deeper inside the atoms can release Energy in larger amounts when compared to a chemical reaction and therefore we can assume that what goes on is a phenomenon half way between "chemical" and "nuclear".

Presently in the first version of the E-Cat, presented to the public, the reactor producing Heat was tightly surrounded by a coiled pipe inside which entered a fast enough flow of water at the temperature of the surrounding environment, insuring that from an input of tap water at environmental temperature the water wouldn't overcome 100°C (~373 °K) at the output.

This was a practical choice avoiding passage of status of the water from liquid to water vapor, which would have introduced internal pressure in the coiled pipe, whilst the cooling process (extraction of Heat from the reactor of the E-Cat) was taking place inside the reactor.

What could be considered the next step in the development of the E-Cat was to take away the cooling coil whose function was of subtracting through water flow the Heat produced by the reactor and letting it dissipate in a natural way.

We have seen pictures of this configuration of the E-Cat showing an object of cylindrical shape (containing the reactor) whose external surface (made of steel) had a dark red color (+/- 500°C or ~773°K) whilst a glimpse of the internal temperature was shown through presence of a yellowish hole in the said cylinder.

We could evaluate, from the said yellowish internal color of the reactor

inside the cylinder, to be in presence of a temperature of +/- 900°C or +/- 1173°K).

This last embodiment of the E-Cat was called Hot-Cat but basically we can say that we are dealing with the same device.

In both of them the Energy internally produced (by the internal reactor) is flowing out at a Coefficient Of Performance COP=6.

In the first, the Heat (Q, Power in kW) produced in the unit of time by the E-Cat is not allowed to build up compression between the atoms of the reactor (therefore no high temperature) and for this purpose the flow of water, running inside the coiled pipe around the reactor, which acts as a coolant is taking away the substance of which Energy is made, through passage in the unit of time of an amount of water contained in a volume in space, subtracting and distributing the amount of Heat produced over the unit of time inside the volume in space occupied (in the unit of time) by the water which absorbs it.

Note: this passage of Heat inside the water follows an isotherm (max T=100°C=+/-373°K, the limit of status of existence over which water is not reliable as a cooler agent since, above that value of temperature, two states of existence will be present in different percentages up to the point in which only water vapor will prevail).

At the same time the cooling process represents degradation of the Status of existence of the Energy present in compressed status between the atoms of the reactor as Heat, produced by the E-Cat in the unit of time, since Heat whilst generated in the volume of the reactor of the device at high temperature and compression in the unit of time is directly subtracted from it as Heat at lower temperature and compression in the unit of time inside the high volume of water which flew inside the coiled pipe in contact with the reactor in the same unit of time.

In the second case in the device that we now call the Hot-Cat, Heat is produced exactly the same manner as to the E-Cat but what is missing is the cooler (coiled water pipe) through which Energy(substance) is carried away by the water flow.

This causes a situation in which the Heat produced in the reactor (pure Energy as substance) needs to build up enough compression between the atoms of it in order to establish a gradient of temperature with the external medium (supposing it to be the air surrounding it at environment temperature) high enough to justify continuous passage through dissipation of the Energy(substance) generated in the reactor during the unit of time (Q, Power in kW) in the surrounding medium (air of the environment) of infinite capacity.

Note: since the temperature of the air outside the Hot-Cat is usually fixed to have an optimal behavior of the device a gradient high enough to permit a condition of continuous production and dissipation of Heat at

COP=6 is required and this would (empirically) fix the internal temperature of the reactor at +/- 900°C or +/-1173°K.

A value of temperature high enough in order to justify the name: “Hot-Cat”.

The only thing that can happen now in the Hot-Cat in the conditions described is direct dissipation in the medium surrounding it (whose temperature must always be lower than that of the reactor) and once satisfied this requirement, the said dissipation will happen in conditions of uniform flow of Energy in the unit of time (dictated by the characters of the device), from the Hot-Cat to the surrounding environment (air at local temperature in our case).

Here then we came to the conclusion that in both cases (E-Cat and Hot-Cat of equal sizes and charge) the Heat produced, during the unit of time, is the same but in the E-Cat we have capture of Heat at lower temperature inside a fixed volume over the unit of time of hot water at +/-°373K before losing it through dissipation (from the hot water into the surrounding medium) and unless in future will be possible to increase the COP, the difference between the two is that in the Hot-Cat the Heat reaches higher local values of temperature due to the fact that Heat is not extracted through a running flow of cold water but is dissipated directly in the surroundings at lower temperature:

Resuming, we have two conditions:

**a)** E-Cat, Extraction of Heat, absorbed through contact with a coiled cooler pipe in which the flow of water is not permitting a buildup of high internal temperature gradient between the inside of the reactor and the water running in the cooler pipe.

**b)** Hot-Cat, Extraction of Heat through direct contact with the surrounding environment, in which the transmission of Energy released in the unit of time depends from a much higher gradient of temperature since takes place directly between the inside of the reactor and the external surroundings.

### Comments regarding the possible future applications of the E-Cat

The possibility to extraction Hot Water from a device like the E-Cat, in the conditions mentioned above is in itself a great step forward at our present stage of civilization, since we depend from Hot Water, in our houses, in many industrial manufacturing processes and in numberless applications which could boost agricultural activities.

Presently many of the processes followed in order to have Hot Water rely on the direct use of fossil fuels, on distribution of electricity, mainly generated in industrial plants of production using fossil fuels and atomic Energy plants, but hydropower, solar power, wind power and direct use of wood are also used where it results economically advantageous.

As one can see both the E-Cat and the Hot-Cat would represent a direct supply of Energy as substance, whilst in the E-Cat Heat produced is subtracted through distribution at lower temperature within a volume many times that of the coiled pipe surrounding the reactor in the case of the Hot-Cat is convenient to subtract Water Vapor (since it is in a status of compression whose capacity to expand is exploitable through mechanical devices).

Energy produced through a simple device as the E-Cat, is contained in Hot Water and obtained through a clean process, (no discharge of polluting radioactive ashes from plants using the power of the atoms, no ashes from fossils and wood coming out of thermoelectric plants and no necessity to build enormous plants using complex machines in need to be replaced at high costs after a period of years of working life, avoidance of the outlook that fossil fuels will eventually change the present composition of Earth's atmosphere (with unforeseeable results affecting its climate) and avoidance of the expectation that at the present rate of consumption Earth's fossil resources will be depleted in a few (two or three) hundreds of Years leaving to our descendants a planet deprived of fossil natural resources whose atmosphere will be subjected to permanent pollution reducing its capacity of dissipate, into the cosmic space, the insulation received from the Sun (to which will correspond increase of air temperature).

With the E-Cat, instead, the availability of Hot Water is practically unlimited in the whole foreseeable future, whilst its potential to benefit human activity cannot be denied since differently from the use of fossil fuels its release on the atmosphere of substances permanently polluting it is practically nil.

One would expect to obtain from the Hot-Cat a lot more benefits from those expected by the E-Cat, since it may be modified in order to produce Water Vapor at a high enough pressure and flow, enabling the movement of a turbine attached to an electricity generator.

The problem is that, we are facing a thermodynamic process in which only a portion of the Heat produced can be transformed into Energy of movement.

Furthermore since presently for the E-Cat and for the Hot-Cat we have a Coefficient Of Performance  $COP=6$ , (this means that one unit of Energy presently supplied as electric power is necessary to keep the

process going inside both E-Cat and Hot-Cat in order to produce six units of Energy in the status of Heat).

In the Hot-Cat the Energy present as Heat or substance compressed between the atoms of the reactor at a constant temperature (up to +/- 1173 °K) , is radiating from its reactor, from which moves away as dissipation in the surroundings but if we cede the said Heat to a small enough flow of water surrounding the core of the reactor, so that from the reactor instead of Hot Water comes out a flow of Water completely in the status of Vapor and at high level of compression (ready to expand capable to produce Work), we go back to a situation similar (but not identical) to that of the E-Cat, the difference in this case is that instead of Hot Water we are facing presence of Water Vapor at high pressure which if released directionally into a turbine connected to a generator will produce an amount of Work in the unit of time (or Power) directly transformed into a flow of electric Energy in the unit of time.

We then have that whereas in the case of the E-Cat we had extraction of a flow of liquid Water containing Energy (Heat) as substance (since the atoms of the liquid Water are only subjected to vibration) in this second case the Energy per unit of volume in the Water Vapor is much higher and we have that subtraction of Energy from the reactor can take place through directional flow of Water Vapor under compression coming out of a nozzle and hitting the blades of the turbine.

This flow of Water Vapor substitutes the direct dissipation present in the Hot-Cat and taking place in time like in the case of the water flow, it will subtract Energy in the unit of time (Power) and reduce the internal temperature of the reactor.

Apparently at present state of art (COP=6) the temperature of a flow of Water Vapor capable to move turbine and associated electricity generator will fall to about 700 °K .

In these condition the behavior of the Hot-Cat will resemble that of the E-Cat inside which the water as a fluid extracting Energy has been replaced by Hot Vapor (a status of the water to be likened to that of a gas) which will have to be hot (compressed) enough to expand when released in order to move the blades of a turbine.

In these new conditions of extraction of Energy the turbine will absorb the directional Power of the vapor generated by contact with the reactor's core (which by now will be at a temperature ~700 °K far lower than the ~1173 °K present in the Hot-Cat (in which prevails dissipation as described above).

The Hot vapor (continuously replaced upstream by an equal amount in mass of liquid water) will be coming out of a nozzle under pressure and will be moving the turbine and connected electric generator with a low efficiency of transformation into Power as Work/t from Power as Heat/t

probably  $\eta < 1/3$ .

In these conditions even if we still assume an efficiency  $\eta = 1/3$  for a COP=6 over the unit of time from 6 units of Heat we get 2 units of Work:

$$\eta = \frac{W}{H} = \frac{1}{3} = \frac{2}{6}$$

Note: Work is over the unit of time, so is Heat therefore the above ratio is between two values of Power.

It will result now that to a power supply in units of Heat over the unit of time  $H=6$  and efficiency  $\eta = 1/3$  will correspond a transformation in units of Work  $W=2$  :

$$\text{Work} = \text{Heat} \cdot \eta = \frac{6}{3} = 2$$

To which we must detract the starter Energy  $E=1$  supplied over the unit of time as Electric Power and equivalent to Work.

In all with a COP=6 through the process taking place in the Hot-Cat modified to produce Energy of movement (transformed with the help of a turbine) into electrical Power supply capable to deliver Work over the unit of time, since we supplied one unit of Work over the unit of time (Power) as starter Energy/t there will be a  $W_{BAL}/t$  (balance output of Energy/t in the status of Work/t) at the device turbine/generator supplied to the Hot-Cat modified in order to produce Hot Vapor under pressure:

Input  $I=1$  as electric Energy/t

Internal Heat production COP=6

Energy/t available, produced through the device Turbine/Generator

$$W = E_{T/G}/t = 2$$

$$\frac{W_{BAL}}{t} = \frac{W}{t} - \frac{I}{t} = 2 - 1 = 1 \text{ [Power-Balance]}$$

Clearly the performance of the Hot-Cat in these conditions is not so attractive since although we produce continuously 2 units of Work we have to detract the input (starter Energy) consisting of one unit of Work.

Note: this explains why Dr Ing Rossi mentioned that an effort was made to substitute to the present input starter Energy (in units of electric Energy) an equal amount of Heat produced firing gas.

Note: since in effects could be  $\eta < 1/3$  the  $W_{BAL}$  mentioned above in actual fact could be much less than the value of  $W_{BAL}$  over the unit of time (the unit of Power produced could be) :

$$\frac{W_{BAL}}{t} < 1 \quad [\text{Power-Balance}]$$

The above result shows that the production of Work, in these circumstances, obviously is not attractive, nevertheless we must say that we only are at the initial stages of discovery of these processes and once will be possible to have a COP>6, the advantages of these transmutations of nickel into copper, taking place without pollution of any kind and producing a continuous output of Energy in the status of Work, would become very evident, for example for a COP=9 and an efficiency  $\eta=1/3$  we could have a LENR with a  $W_{BAL}$ :

$$W_{BAL} = \frac{\text{Heat}}{3} - 1 = \frac{9}{3} - 1 = 2$$

A result that could change the entire scenario.....

Nevertheless a higher COP would require higher temperature of the Hot-Cat and consequently higher risk of fusion of the reactor associated with possible frequent interruptions of service and more costly controls of production, that when a single unit is privately used could render uneconomical both E-Cat and Heat-Cat.

I am confident that these problems and many more others, presently unknown and associated with this invention will be solved in the future as experience shows that here we are on a path leading to Scientific advances.

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