UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF FLORIDA

ANDREA ROSSI and LEONARDO CORPORATION,

Plaintiffs,

v.

THOMAS DARDEN; JOHN T. VAUGHN, INDUSTRIAL HEAT, LLC; IPH INTERNATIONAL B.V.; and CHEROKEE INVESTMENT PARTNERS, LLC,

Defendants.

CASE NO. 1:16-cv-21199-CMA

SUPPLEMENTAL EXPERT REPORT OF RICK A. SMITH, P.E.

INDUSTRIAL HEAT, LLC and IPH INTERNATIONAL B.V.,

Counter-Plaintiffs,

v.

ANDREA ROSSI and LEONARDO CORPORATION,

Counter-Defendants,

and

J.M. PRODUCTS, INC.; HENRY JOHNSON; FABIO PENON; UNITED STATES QUANTUM LEAP, LLC; FULVIO FABIANI; and JAMES BASS,

Third-Party Defendants.

SUPPLEMENTAL EXPERT REPORT OF RICK A. SMITH, P.E.

Defendants Thomas Darden, John T. Vaughn, Industrial Heat, LLC ("IH"), IPH International, B.V. ("IPH"), and Cherokee Investment Partners, LLC (collectively, "Defendants"), pursuant to Fed. R. Civ. P. 26 (a)(2)(B), hereby submit this supplemental expert report of Rick A. Smith, P.E.:

I. INTRODUCTION

I, Rick A. Smith, P.E. principal of Applied Thermal Engineering, Inc., located at 7400 Brown Road, Ostrander, OH 43061, have been retained by counsel for Defendants in the above-captioned litigation to provide my opinions concerning the reported validation of certain low energy nuclear reactor ("LENR") technology referred to as the "E-Cat." Specifically, I have been asked to render my opinions on the following issues:

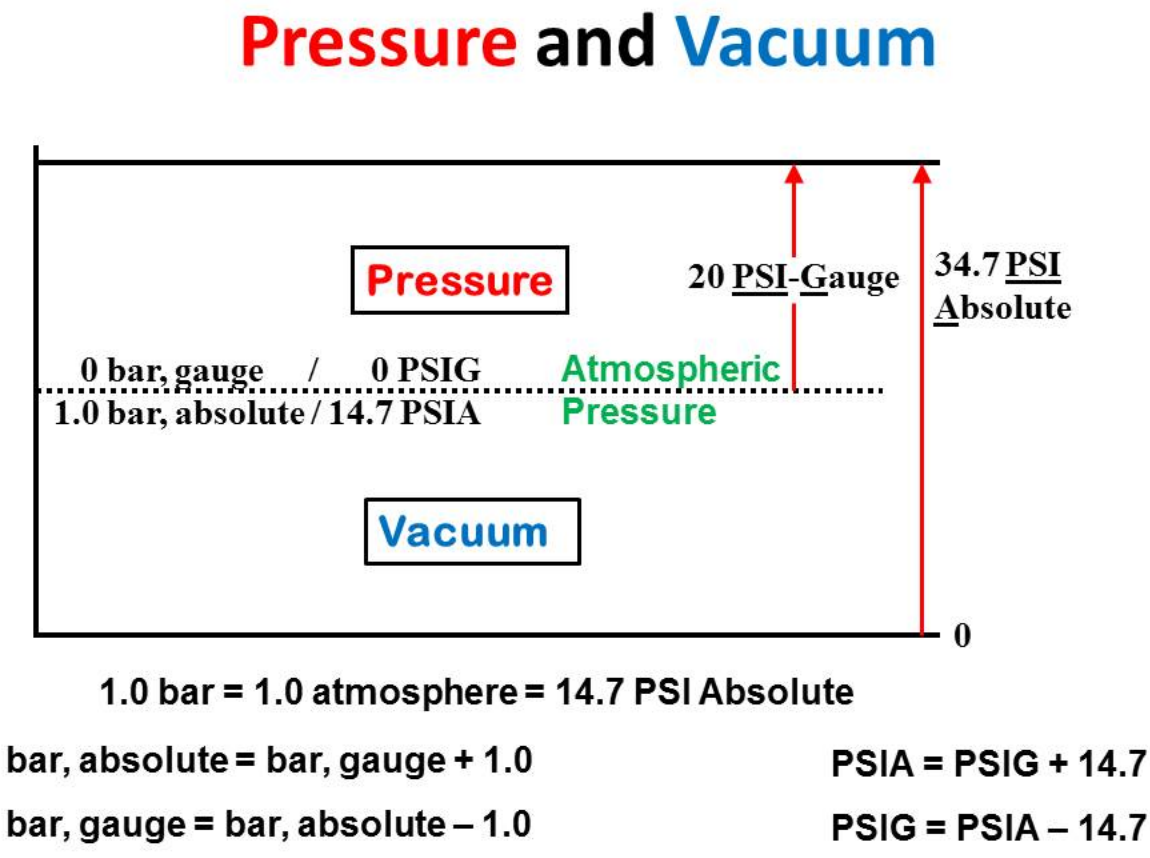
1. Whether the device tested by Mr. Penon in Doral, Florida, from February 2015 through February 2016 operated at a coefficient of performance of at least 10.85 for a period of 350 days (even if not consecutive) within any 400 day period prior to March 29, 2016.
2. Whether the device so tested in Doral consistently produced energy more than 2.6 times greater than the energy consumed by the device and whether the temperature of the steam produced by the device was consistently 100 degrees Celsius or greater.

II. STATEMENT OF OPINIONS

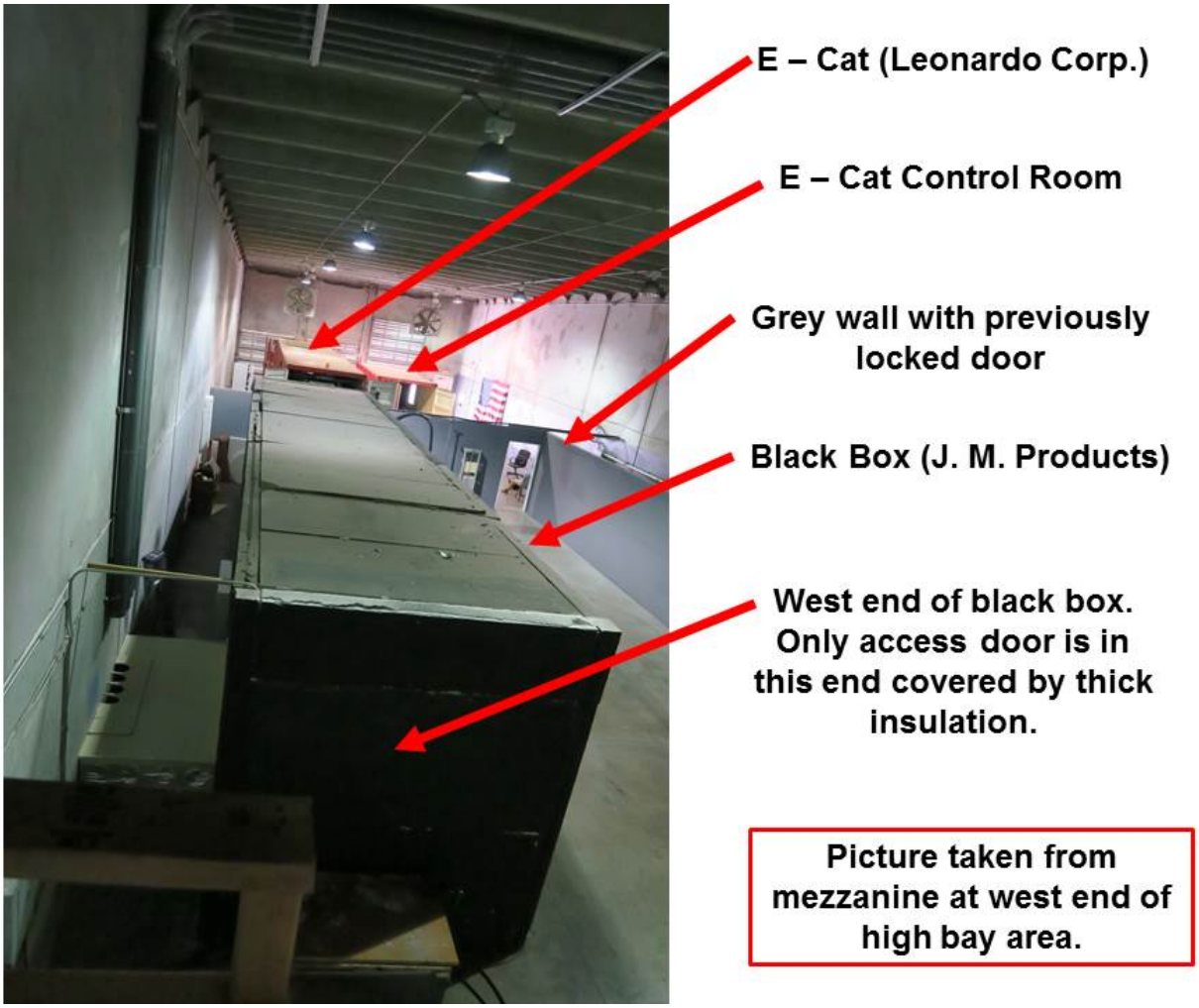
Based upon information received by the author subsequent to his expert report, including his visit to the Doral site on 02 Mar 2017, he is supplementing his report as follows.

"Steam" flow from the E-cat to the Black Box

This analysis is based upon the assumption that steam was flowing from the E-Cat to the Black Box. As will be shown, the author unequivocally believes that this never happened. That is why steam is in quotation marks in various places. The outlet "steam" pressure reported by Mr. Penon was always 0.0 bar gauge, which equals 1.0 bar absolute, which equals 0.0 PSI Gauge, which equals 14.7 PSI Absolute (at sea level). Note: This author will use the English system as opposed to the metric system wherever possible. The chart below shows the relationship between these methods of pressure measurement.

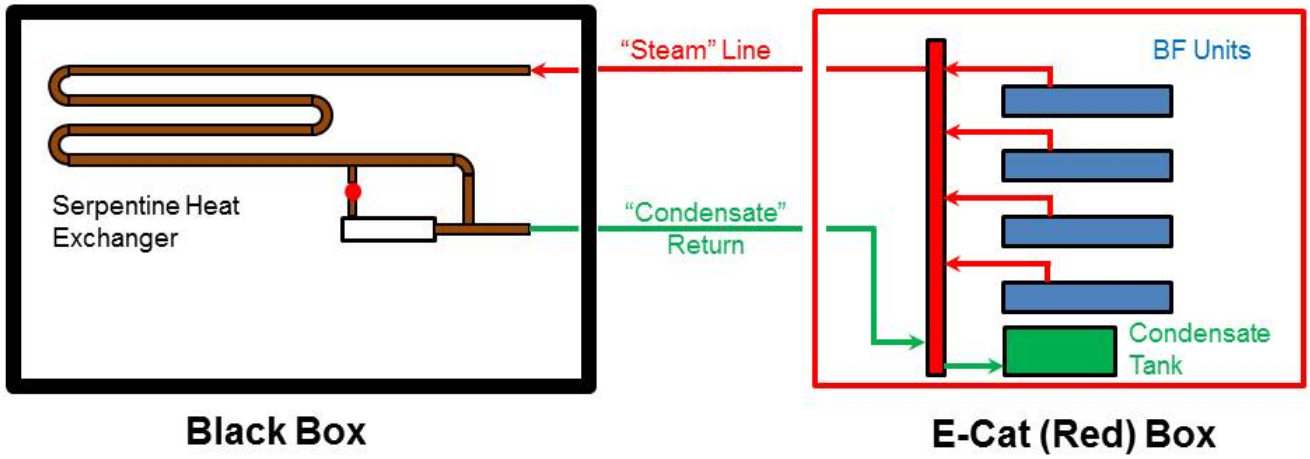


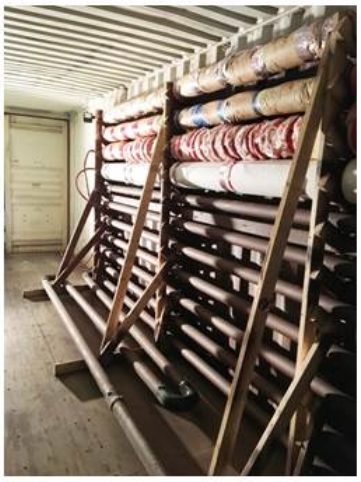
Please recall that the E-Cat purportedly supplied steam to a company called JM Products, whose supposed manufacturing facilities were on the other side of a grey wall in the Doral facility and were not accessible to Industrial Heat personnel.



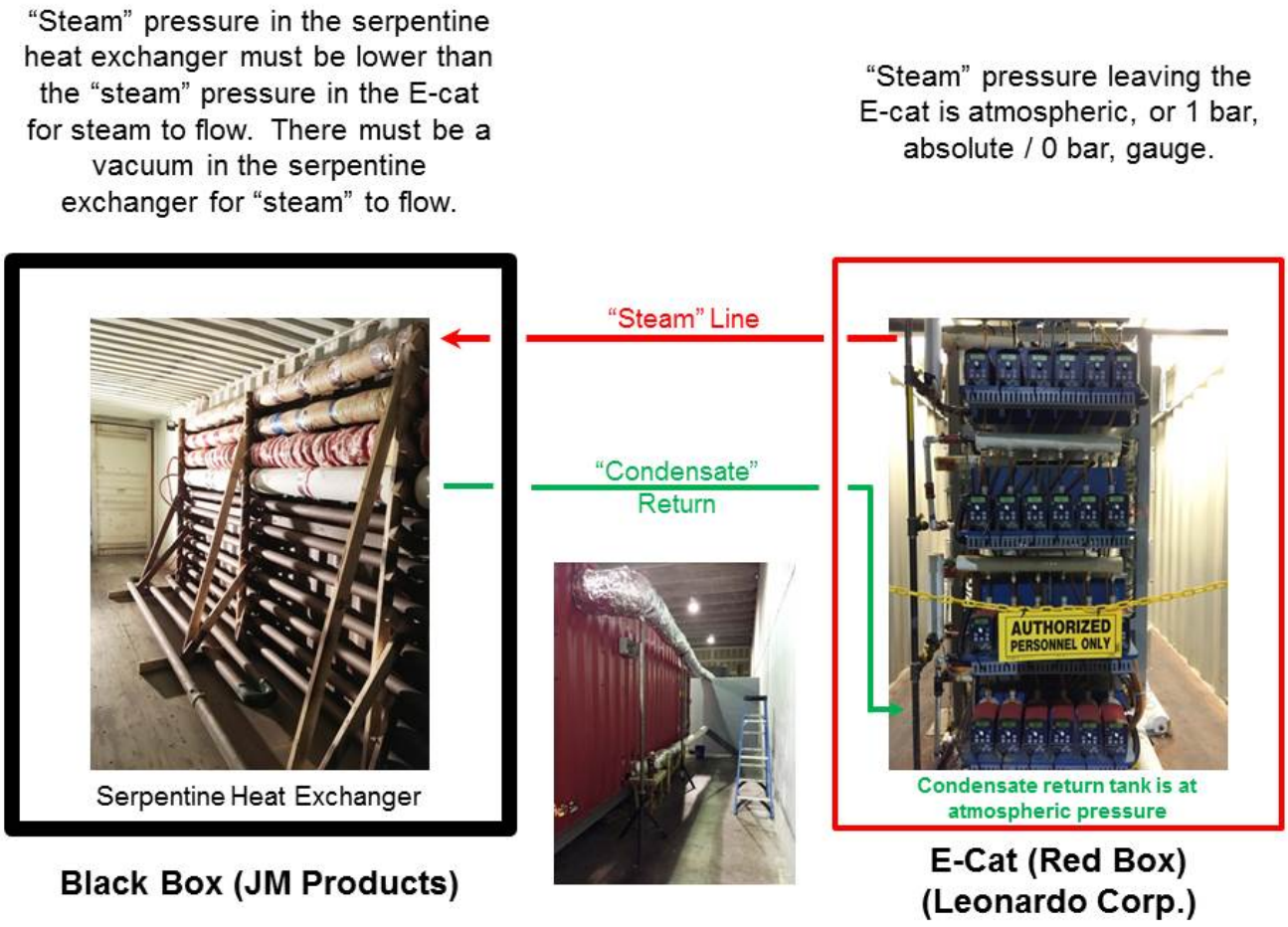
The black box is heavily insulated with only one access door on the west end. In order to get inside the black box, the insulation on the west end must be removed.

Below is a semi-schematic pictorial of the layout shown above.





The picture below shows that there must be a pressure difference between the E-cat and the black box for "steam" to flow from the E-cat to the black box and condensate to flow back from the black box to the E-cat.



For any liquid or gas to flow, there MUST be a pressure difference. Fluid flow will always be from the higher pressure area to the lower pressure area. Recall that the "steam" from the E-cat was being generated at atmospheric pressure (0 barg, or 0 PSIG).

If "steam" was flowing from the E-Cat to the black box, there must have been a pressure difference for any flow to occur. It will be informative to estimate the theoretical steam pressure drop between the two boxes.

The highest daily energy output reported by Mr. Penon was 21,500,000 watt-hours (thermal) per day on 09 Apr 2015. The lowest output reported was 12,400,000 wh/d (thermal) on 31 May 2015. This will now be converted from daily megawatts – thermal to steam flow.

This author measured the internal diameter (ID) of small remaining section of the E-Cat outlet pipe at 4.5" ID. We will now determine what the steam flow velocities theoretically would have been at the highest and lowest reported outputs. This is a theoretical calculation only as a later explanation will show that there could be no steam flow under the steam conditions present during the validation period.

Mr. Bass, in his deposition, recalled that the steam line was 3" or 4". If the steam line diameter was reduced down from the E-cat outlet to a smaller size, the theoretical steam velocity would go up, dramatically.

The continuity equation, which calculates the fluid flow through a pipe or a duct, is valid for both gases and liquids at sub-sonic velocities.

$\dot{M} = \rho \times V \times A$ is the continuity equation.

$V = \dot{M} / \rho \times A$ is the velocity equation

$\dot{M}$ is the mass flow rate

ρ is the density of the fluid

V is the flow velocity

A is the flow area of the pipe

Latent heat (the amount of heat it takes to convert a pound of water at 212° F to a pound of steam at 212° F) of steam at atmospheric pressure [0 bar, gauge (barg) or 0 Pounds per square inch, gauge (PSIG)] = 970.4 BTU per pound of steam (from Keenan and Keyes).

Density of steam at atmospheric pressure = 0.0373 lb. per cubic foot (from Keenan and Keyes).

Flow area of the 4.5" ID pipe is 15.9 square inches, or 0.110 square feet.

One watt = 3.413 Btu's Per Hour (BTUH).

$\dot{M} = \{[(21{,}500{,}000 \text{ wh/d}) \div (24 \text{ hrs. / day})] \times [3.413 \text{ BTU / w}]\} \div 970.4 \text{ BTU / lb.}$

$\dot{M} = 3151$ lb. per hour of steam at atmospheric pressure

$V = 3151 \div (0.0373 \times 0.110) \div 60$

V = 12,800 feet per minute (FPM) or 145 miles per hour

This is above the industry recommended maximum steam flow velocity of 6,000 FPM. The industry standard (Crane Companion, page 3-16) is from 4000 FPM to 6,000 FPM for low pressure steam.

At the lower reported output of 12,400,000 wh/d (thermal), the steam flow velocity would have been:

V = 7380 FPM This is also above industry standards.

The author assumed an equivalent length of pipe at 75 feet, based upon the site visit. Using the Babcock steam flow formula, the pressure drop was about 0.5 PSI. Using the Unwin formula, the pressure drop was about 0.7 PSI. This is not an excessive pressure drop, even at the high flow velocities calculated. If this were a conventional steam and heat exchanger system operating even at 10 – 15 PSI, there would be no problem. However, there is a major problem with the steam system as designed.

For any liquid or gas to flow, there MUST be a pressure difference. Fluid flow will always be from the higher pressure area to the lower pressure area. Recall that the alleged steam was being generated at atmospheric pressure (0 barg, or 0 PSIG). If the pressure drop from the E-Cat to the black box was 0.5 PSI, then the piping in the black box **must have been** in a vacuum. This is problem number one.

The condensate return line from the black box back to the E-Cat dumps into a tank in the middle of the E-Cat box. This tank is eventually vented to atmosphere. So, the pressure in the condensate return tank is atmospheric, or 0 barg. If the steam supply and the condensate return in the E-Cat are at atmospheric pressure, and the pressure in the serpentine coil in the black box is in a vacuum, there is absolutely no way that there will be any steam flow between the two boxes, regardless of pipe size. Problem number two.

Recall from the first report that if one boils water (212° F) to make sweet tea and leaves the hot tea sitting on the counter, what happens to it? Does it naturally get hotter or does it eventually cool down to room temperature? We all know that it cools to room temperature eventually, even though it may take a while. The converse is also true. If we take sweet tea from the refrigerator at 40° F, it will warm to room temperature eventually. The key and crucial concept of these examples is that there has to be a temperature difference to have heat transfer.

Fluid flow **requires** a pressure difference and heat transfer **requires** a temperature difference.

So, from a flow (pressure difference) standpoint, there can be no steam flow (other than a de minimus amount to warm the system), regardless of pipe size, from the E-cat to the black box.

Mr. Rossi may claim that there was a steam circulator in the system. If he makes that claim, then he should have no problem providing concrete proof of its existence and location. That may be a problem as the author has never heard of a steam circulator, and an internet search revealed no such device.

Mezzanine Heat Exchanger

Plaintiffs are now claiming that the heat rejection was not done in the black box, but by a heat exchanger located in the mezzanine at the west side of the facility. To date, there has been no evidence presented that such a heat exchanger existed. No photos, drawings, calculations, purchase orders, construction documents, etc. have been provided to the author. When Mr. Murray and the author inspected the Doral site on 02 Mar 2017, we found absolutely no physical evidence that there had been a heat exchanger in the mezzanine.

There was no lighting, other than the windows, no electrical power (save two small junction boxes and some small conduit), no holes or patches where conduit and power boxes would have been mounted, no holes or patches where piping would have been supported, no hole patches in the floor or the drywall wall – in short, nothing. The only access to the mezzanine is a rickety wooden stairs, which the attorneys made this author climb first (load test) before they would use it.

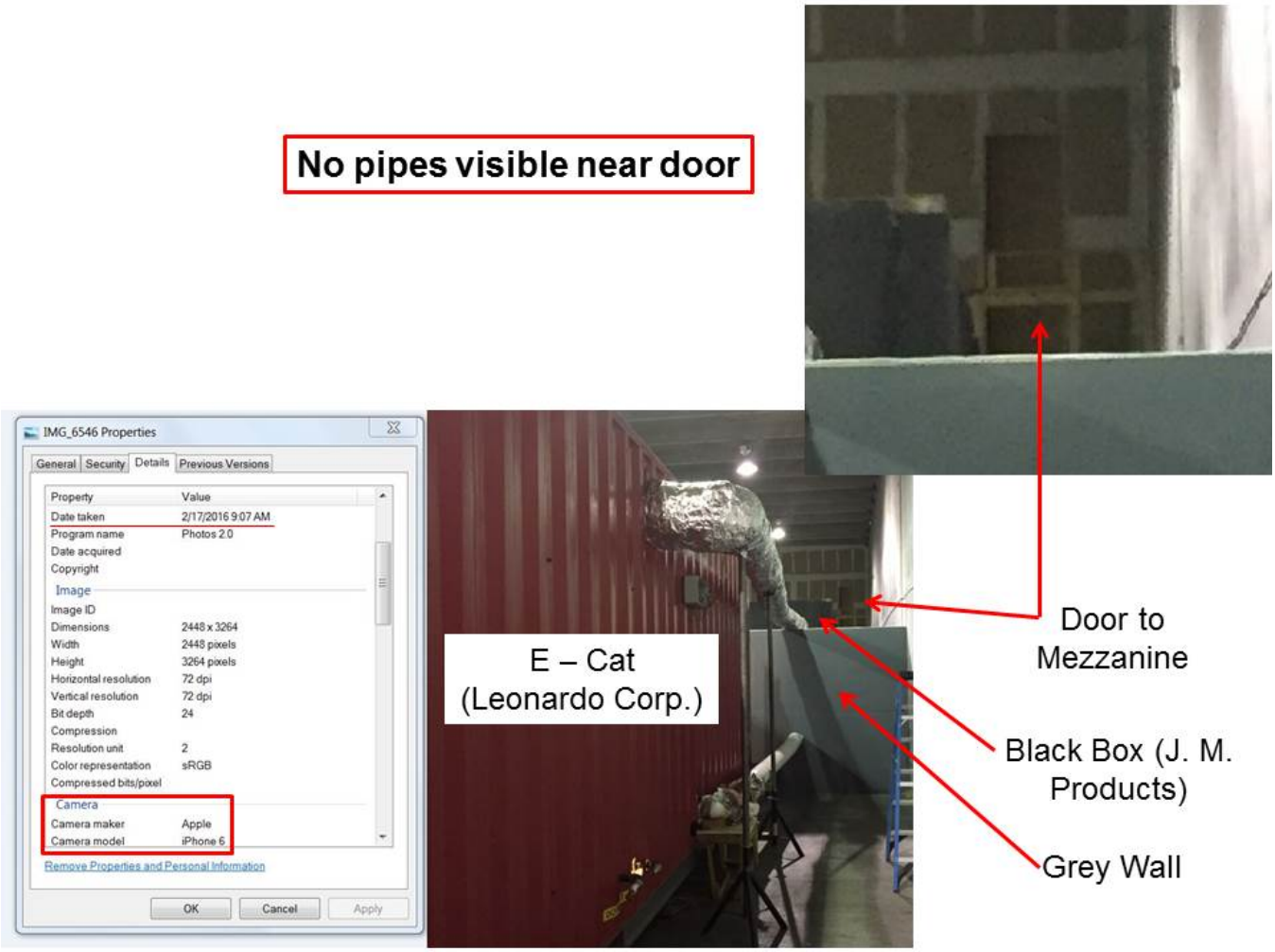
The door to the mezzanine is about 22-1/2" wide by about 79" high. It would be extremely difficult to get equipment, piping, conduit, duct work, and the other items for such an installation up the narrow, rickety stairs and through that narrow door into the mezzanine. The other alternative would have been to remove one of the window assemblies and rig the equipment from the west parking lot up into the mezzanine. The building owner may have records of this being done, or the rigging company surely would have purchase orders and invoices for that work.

Plaintiffs are also now claiming that their heat exchanger vented through one of the windows on the west side of the mezzanine, facing the street (NW 79th Avenue). The picture below was taken by an investigator during October, 2015.

Picture taken from street on 03 Nov 2015.

The pressure issues analyzed in the previous section would also apply to a heat exchanger in the mezzanine as there is a lot more pipe and several feet of elevation change.

Even assuming one could create a heat exchanger of the type claimed by Mr. Rossi, without any documentation reflecting such creation, there are additional reasons to conclude that no such heat exchanger was created. The author believes that Mr. Rossi has stated that the pipes (6" nominal) from the black box to the mezzanine heat exchanger went through the door to the mezzanine. Let's look.



The above picture was taken the morning after the validation test was completed. If the pipes that were purportedly present for the test were subsequently removed by 9:00 a.m. (as reflected in the metadata for the photograph above) the day after the test was finished on 16 February 2016, this would qualify an extraordinarily rapid demolition project.

This is a video screen capture from IMG_1781 taken during one of Mr. Penon's site visits.

The above picture is a video screen capture from IMG_1781 taken during one of Mr. Penon's site visits. No pipes are visible in this view either.

The alleged fans for the heat exchanger would have moved about 30,000 cubic feet of air per minute (CFM). If all of the makeup air were coming through the door, it would be flowing through the door at about 27 MPH. The differential pressure on the drywall wall of the mezzanine would be considerable. Unless the dock doors were open, the building would be very negative, even with air back drafting through the two ceiling vents in the high bay area.

The fans would have a combined power of about 25 horsepower. This should show up on a close analysis of the FPL hourly data, compared with the E-cat electrical data.

If there were a heat exchanger and cooling fans in the mezzanine, there is absolutely no evidence of their existence.

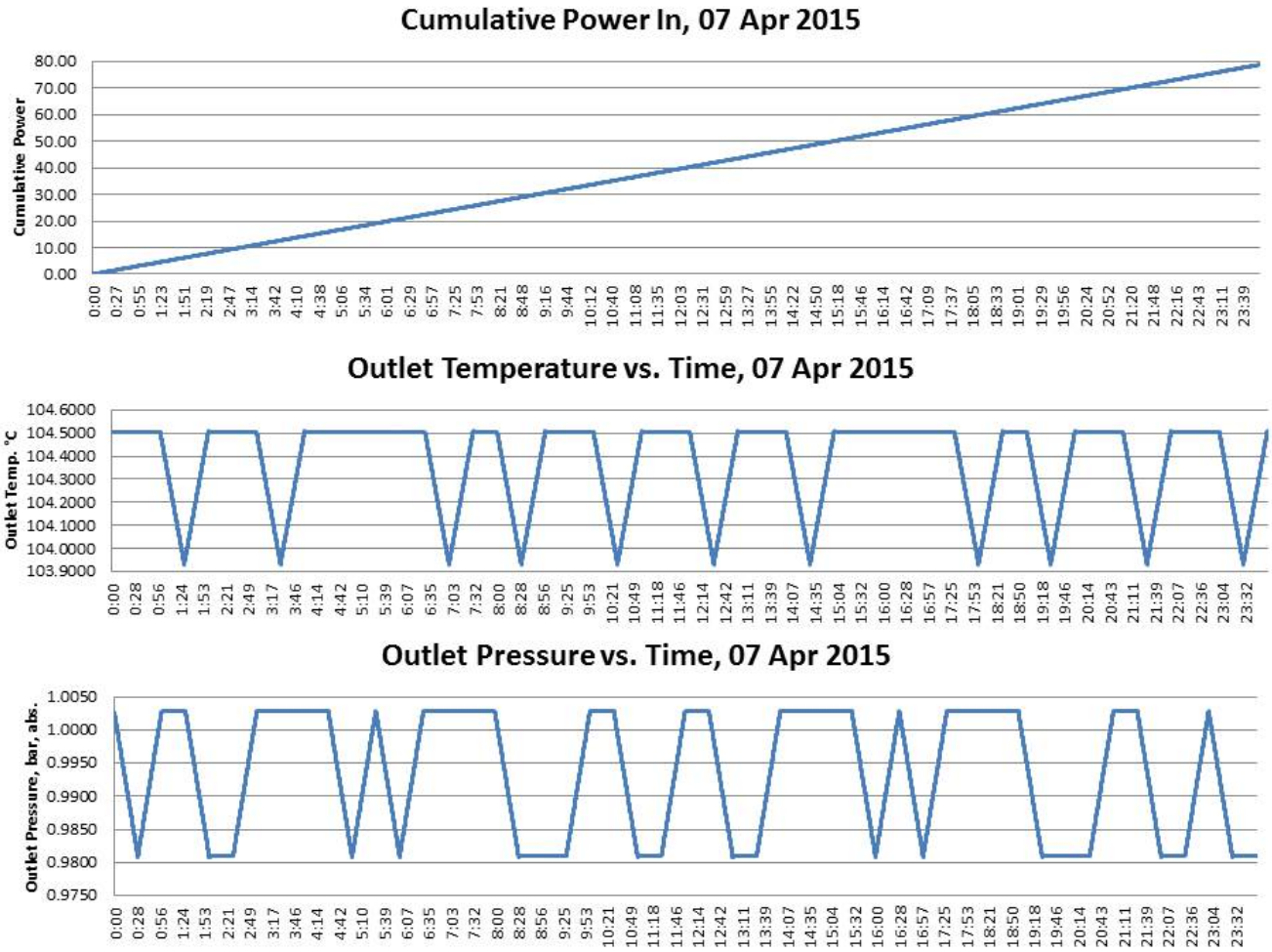
Data Anomalies

The author tried to analyze Mr. Fabiani's thermal data, but the size and format of his files makes this a massively time consuming endeavor. For that reason, the author will only examine a couple of days with power interruptions.

Mr. Fabiani's pressure and temperature data are reported to four decimal places. This would lead one to believe that the instrumentation used was capable of measuring pressure to 1/10,000 of a bar and temperature to 1/10,000 of a degree C. This is some serious research grade instrumentation.

What is not shown is also significant. Plaintiffs are claiming that measuring the water flow back into the E-cat is equivalent to measuring the output of the E-cat. That being the case, it would seem that the water meter output data should appear in Mr. Fabiani's data – but the author cannot find it.

On 07 Apr 2015, there was a day long power interruption. Here are graphs of Mr. Fabiani's power input, pressure output, and temperature output data for 07 Apr 2015.



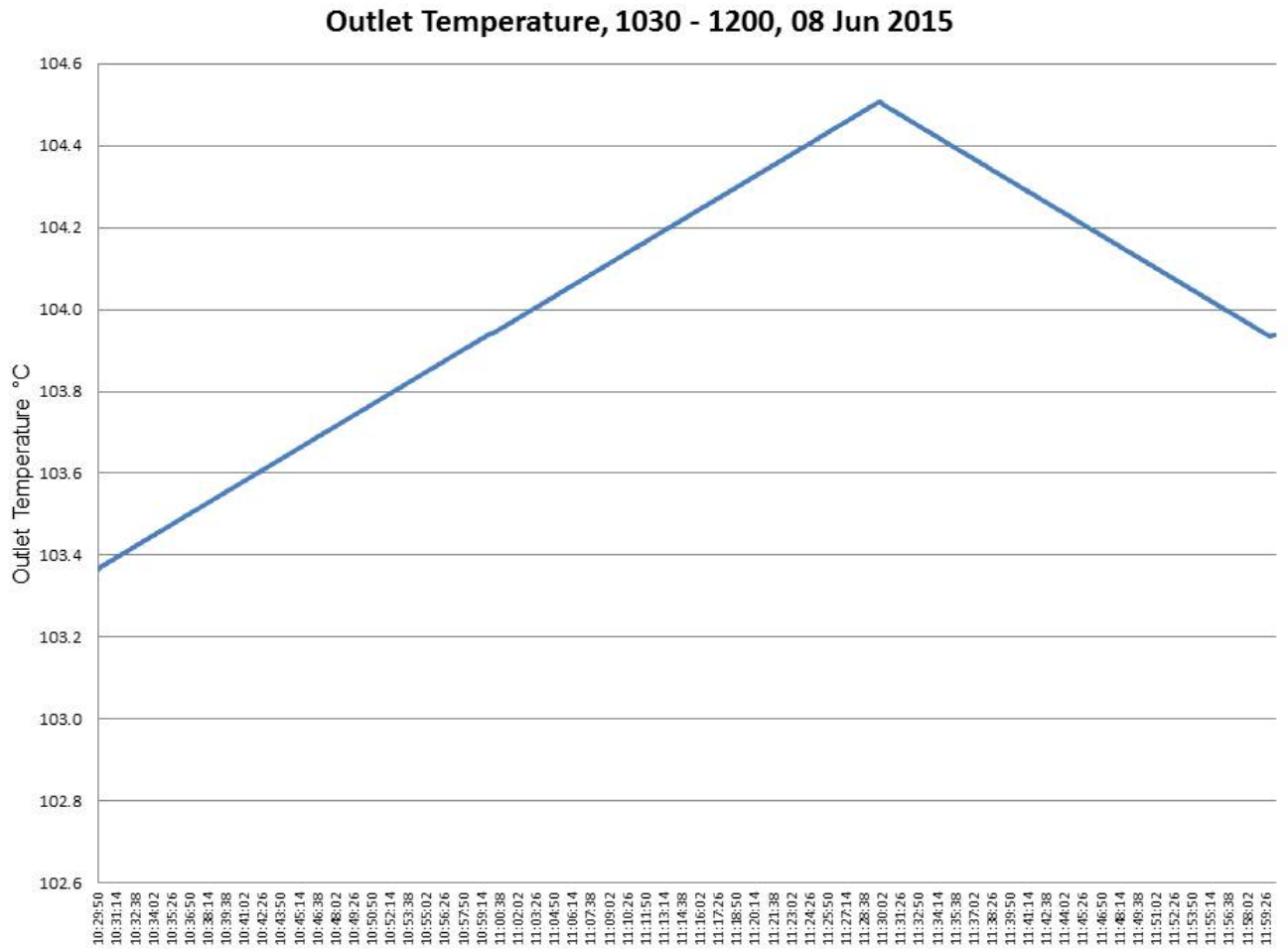
Since there was a power interruption that day, one would expect to see a graph of the power input as a flat line at zero. However, the power is slowly and steadily increasing all day in a very linear fashion.

One would expect the output temperature to slowly decrease as the day progressed. The charted temperature behavior does not reflect this. If plaintiffs claim that the E-cat reactors kept producing heat after the power was shut off, one would expect to see the temperature keep rising to some maximum and then start to decrease. The exhibited temperature behavior is strange to say the least.

The pressure behavior is equally strange. It increases in a linear fashion, stays constant for a while, decreases in a linear fashion, stays constant for a while, and then increases in a linear fashion again.

On 08 Jun 2015, there was a 90 minute power interruption.

Below is a graph of the output temperature during that time period.



One would expect to see the temperature remain somewhat steady for a short while after the power was shut off, and then start to decrease. Instead, the temperature increases (after a power shutdown) in a very linear fashion from 103.3657 at 10:29:50 to 104.5082 at 11:29:49 and then decreases in a linear fashion for the next half hour. It could be argued that thermal momentum is responsible for this phenomenon. If this were a hot water system [more on this later], this argument might have some plausibility. However, this is alleged to be a steam system. Steam systems have very little thermal momentum compared to hot water systems as water is about 1600 times as dense as steam at these low steam pressures.

It could be argued that the temperature rose because the E-cat reactors continue to produce heat after the power is removed. However, feedwater flow will cease, because the BF unit feed pumps have no power. With no feedwater flow, and continued heat output from the E-cat reactors, the water will continue to boil and the temperature and pressure in the system will continue to rise. The data show that the temperature did rise, so what about the pressure?

The pressure stayed at precisely 1.0028, with no variation (to the 1/10,000 of a bar) for all but the first four seconds of the power outage, in other words, for the next hour and a half. The laws of thermodynamics prohibit this because of the pressure / temperature relationship of boiling fluids – as the temperature rises, the pressure **must** also rise.

Comparing the temperature and pressure behavior of the system on two different days with power outages reveals quite different behavior.

A spreadsheet entitled, "MW1USA Electric data & Events.ods ENG", is Mr. Fabiani's twice daily rollup of the electrical data for the validation period. The Italian notes and labels have been translated into English, but the data have not been altered.

On 2. Dec 2015, Mr. Fabiani notes this, "power decrease to 700kw upon client's request". However, Mr. Penon's data indicates a produced energy value of 1,41E+07, which is engineering notation for 14,100,000 watts per day. Dividing this by 24 hours yields 587,500 watts or 587.5KW. There is a 112.5KW discrepancy between Mr. Fabiani's data and Mr. Penon's reported output. One could logically ask who is correct, and why the discrepancy.

On 22. Dec 2015, Mr. Fabiani notes this, "reactor 2 reboot and power generated taken back to 1MWh/h upon client's request". Similarly, Mr. Penon reports a produced energy value of 2,03E+07, or 20,300,000 watts per day. Dividing by 24 yields 845,833 watts, or 845.3 KW. There is a 154.2KW discrepancy here.

Because of these incidents, and likely many others, all of the data in the Penon report must be viewed with extreme skepticism.

Feedwater Flow

The E-cat is comprised of two basic modules, the EC units are the small ones on the east side of the red E-cat box. The four BF units are on the west side of the E-cat. These are shown below.

BF Units on west side of red box

EC Units on east side of red box

The EC units were only used prior to the validation. They were shut down on 19. Feb 2015, according to Mr. Fabiani "6 individual modules groups off", and were not used again. Only the four BF units were used for the majority of the validation period.

Each BF unit has six identical small pumps to feed water into the reactor / boiler section of each unit. A closeup of the six pumps for a single reactor is shown below. Also shown is the nameplate for one of the pumps.

Close up of the feed pumps for an individual BF unit.

Close up of the name plate of an individual feed pump. Dosierleistung is translated as dosing capacity or maximum flow.

Max. output is 32 liters per hour.

As the closeup show, each pump has a maximum capacity of 32 liters per hour. Dosierleistung is translated as dosing rate, or maximum flow. The maximum flow rate for all 24 feed pumps is:

l/h = 24 x 32 l/h

= 768 liters per hour

Since a liter of water nominally weighs a kilogram, the mass output is:

kg/h = 768 l/h x 1 kg/l

= 768 kg/h

A kilogram of water coming into a boiler equals a kilogram of steam leaving a boiler. A kg of water is a kg of steam. The BF's cannot put out more steam than incoming water – no matter what the reactors may or may not have been doing. Therefore, the maximum steam output of all four BF units combined is 768 kilograms per hour. To determine the energy output, the steam flow is multiplied by the latent heat of vaporization. This is the amount of energy it takes to boil a kilogram of water at 100° C to a kilogram of steam at 100° C.

The latent heat of vaporization is 627.5 watt-hours/kg. The maximum total energy output of the four BF units is, in watts:

W = 768 kg/h x 627.5 watt-hours/kg

= 481,920 Watts

≈ 482 KW thermal

The lowest daily produced energy number reported by Mr. Penon, was 1,24E+07 (12,400,00 wh/d) on 31 May 2015. This gives an hourly output of:

W = 12,400,000 ÷ 24

= 516,667 W

≈ 517 KW thermal

The highest daily produced energy number reported by Mr. Penon, was 2,15E+07 (21,500,00 wh/d) on 08 Apr 2015. This gives an hourly output of:

W = 21,500,00 ÷ 24

= 895,833 W

≈ 896 KW thermal

The most common produced energy number reported by Mr. Penon, was 2,03E+07 (20,300,00 wh/d) on 31 May 2015. This gives an hourly output of:

W = 20,300,000 ÷ 24

= 845,833 W

≈ 846 KW thermal

Only the four BF units were running during the majority of the validation period. At times, some units were down for repair or maintenance. Their combined maximum steam output is 482 KW thermal. Despite this, Mr. Penon reported significantly higher produced energy numbers for the entire test.

It is the author's opinion that the produced energy numbers in Mr. Penon's report are incorrect and therefore, his entire report is invalid.

Mr. Rossi's claim that his reactor device produces more energy than it consumes is impossible enough. However, it is not physically possible for the boiler portion of his machine to create water and steam from nothing.

Water Flow Issues

The validation test used (wrongly in the author's opinion) return water flow back into the E-cat as the basis for the alleged steam flow output values. An input is not an output. As mentioned in the author's first report, a proper steam flow meter should have been used to measure the steam flowing out of the E-cat.

Most of the "reduced flowed water (kg/d)" numbers in Mr. Penon's report are 32400, so this value will be used in this analysis. Converting kilograms per day to gallons per minute (GPM) is as follows.

GPM = (32400 kg/day) x (2.2 lb./kg) x (1 day/24 hours) x (1 hour/60min.) x (1 gal./8.34lbs.)

= 5.94 gal./min.

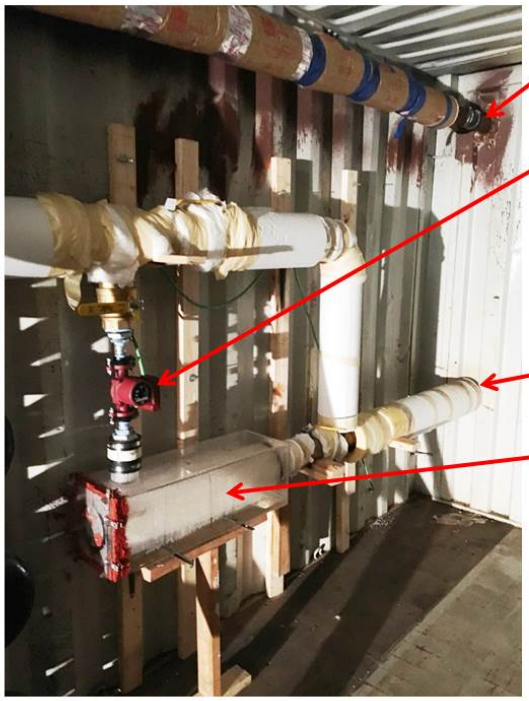
≈ 6.0 GPM

The author is absolutely unequivocal in his opinion that there could have been no steam flow out of the E-cat, and that using return water flow is not a measurement of the alleged steam flow leaving the E-cat. That being the case, how could Mr. Penon have reported the water flows that he did?

During our site visit, Mr. Murray discovered a small Grundfos circulating pump under the stairs to the mezzanine. It is show below.

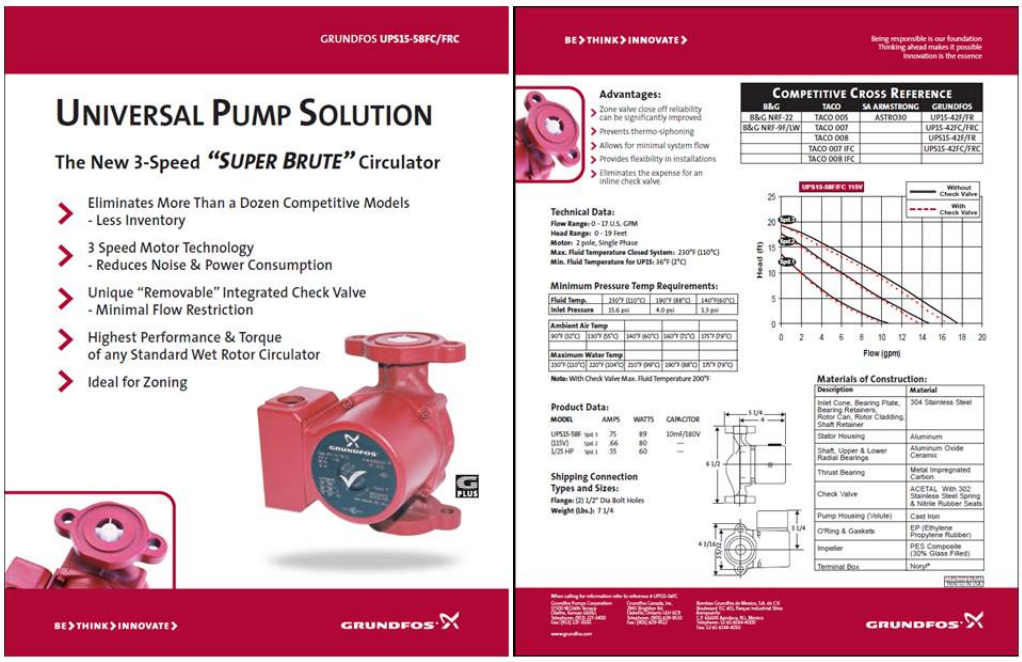
Grundfos UPS15-58FC circulator pump found under the stairs to the mezzanine

The picture below shows the Grundfos pump as it was installed on the outlet of the serpentine coil inside the black box (JM Products).

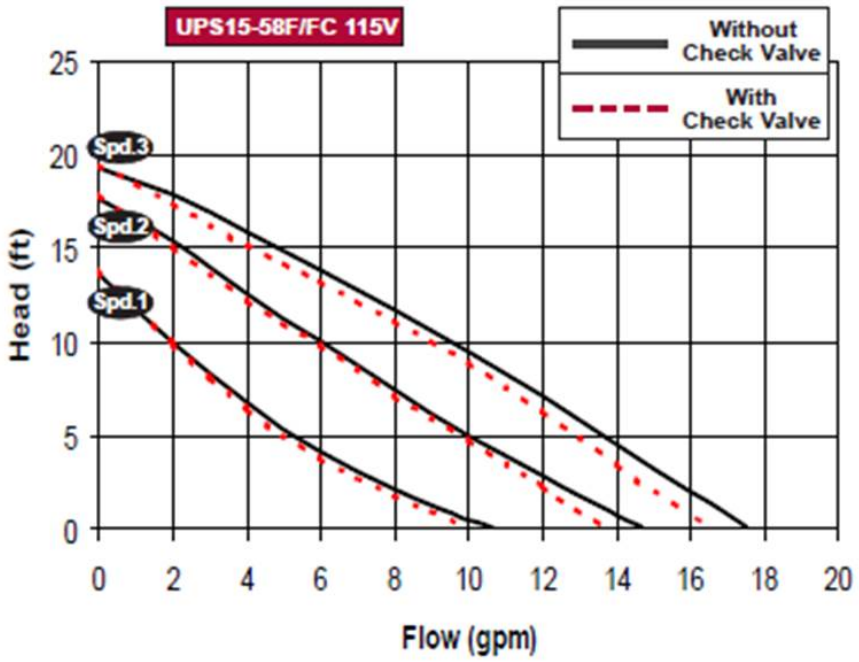


Components inside black box (JM Products)

Shown below is the Grunfos brochure for this pump.



Below is a close up of the flow data.

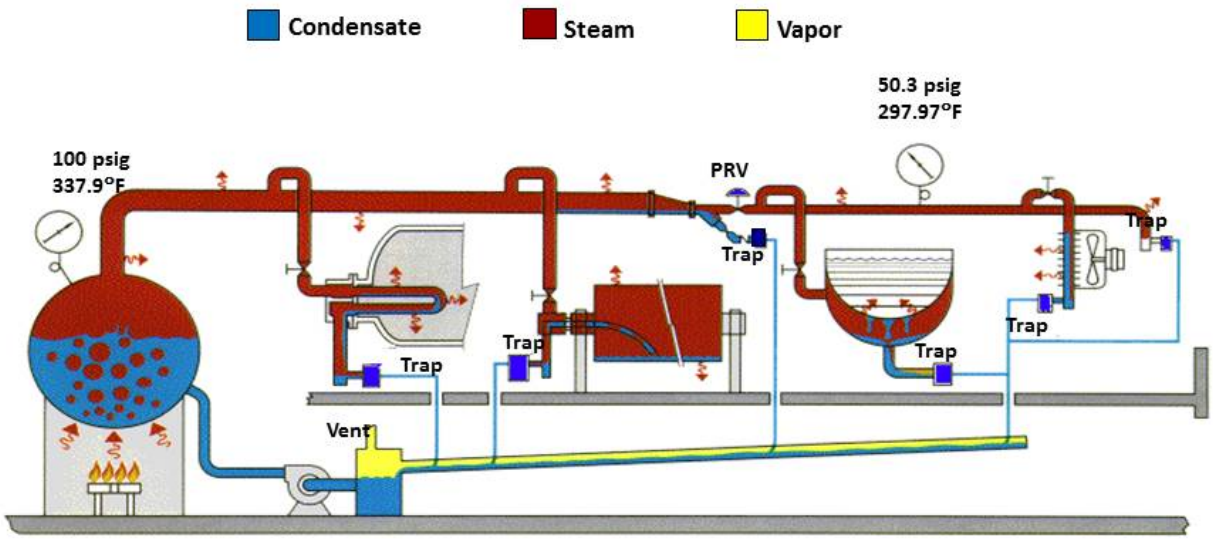


The pump flow rate in gallons per minute (GPM) is shown on the horizontal axis and the pump output pressure in feet of head is shown on the vertical axis. This little pump is capable of flowing 6 GPM (Mr. Penon's 32,400 kg/day) at any speed.

The earlier analysis in this report has shown that the E-cat is not capable of flowing steam to the black box. Because of this, the author has suspected that instead of a steam and condensate system, water was being heated in the E-cat and circulated through the piping to the black box and back.

Before this can be discussed, it is necessary for the reader to understand what a typical, conventional steam and condensate system looks like. The picture below is from Armstrong International and depicts a "normal" steam system, with a "typical" steam pressure. As previously mentioned, there is a pressure differential in this system, so that steam can flow properly from the boiler to the heat exchangers.

Conventional Steam System

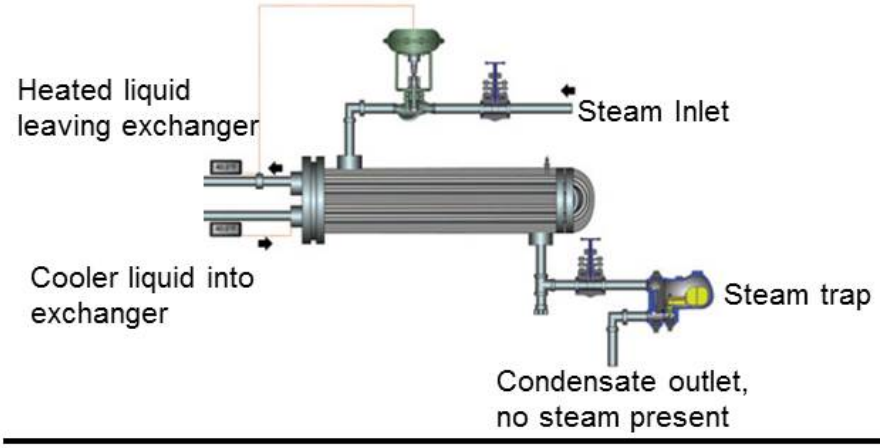


1. Each piece of steam using equipment has a steam trap.
2. The end of the steam line has a steam trap.
3. In each portion of the system, the steam "dead ends", it does not flow through.
4. Steam does not flow through the steam trap, condensate does.

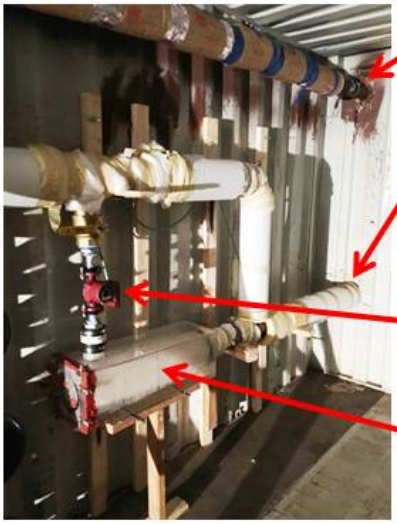
The above picture and the numbered notes give a good basic description of a "conventional" steam system. A crucial point to understand is that steam does not flow through the system and then loop back to the boiler. The steam main "dead ends" with a steam trap at its terminus. In each piece of heat exchange equipment, the steam flows through the exchanger, but its flow stops at the steam trap, which is installed at the outlet of each heat exchanger.

A steam trap is a device to "trap" steam inside a heat exchanger so that the steam can give off its heat and condense back into water (condensate). The steam flows into the exchanger, stops, gives off its heat to heat the product or process, and then condenses after it has given up its heat. The steam trap allows condensate to flow through it, but not steam, and is an absolutely essential piece of equipment for a heat exchanger.

It might be informative to compare a properly piped conventional steam heat exchanger and the serpentine heat exchanger which was in the black box of JM products.



Properly piped steam heat exchanger



Serpentine heat exchanger in black box

- With no steam trap present, "steam" can flow back to E-cat, there is nothing to keep it in the heat exchanger.
- Pumps of this type are never used at the outlet of heat exchangers.

In comparing the two, one can see that the black box heat exchanger does not have a steam trap, but it does have a liquid pump. There is no way to stop the alleged steam flow and trap the steam inside the heat exchanger while allowing the condensate to pass through.

The only reason for this unconventional piping arrangement is that hot water is circulating through the system, not steam and condensate. As has been shown previously, there can be no steam flow through this system because of both pressure difference and temperature difference issues.

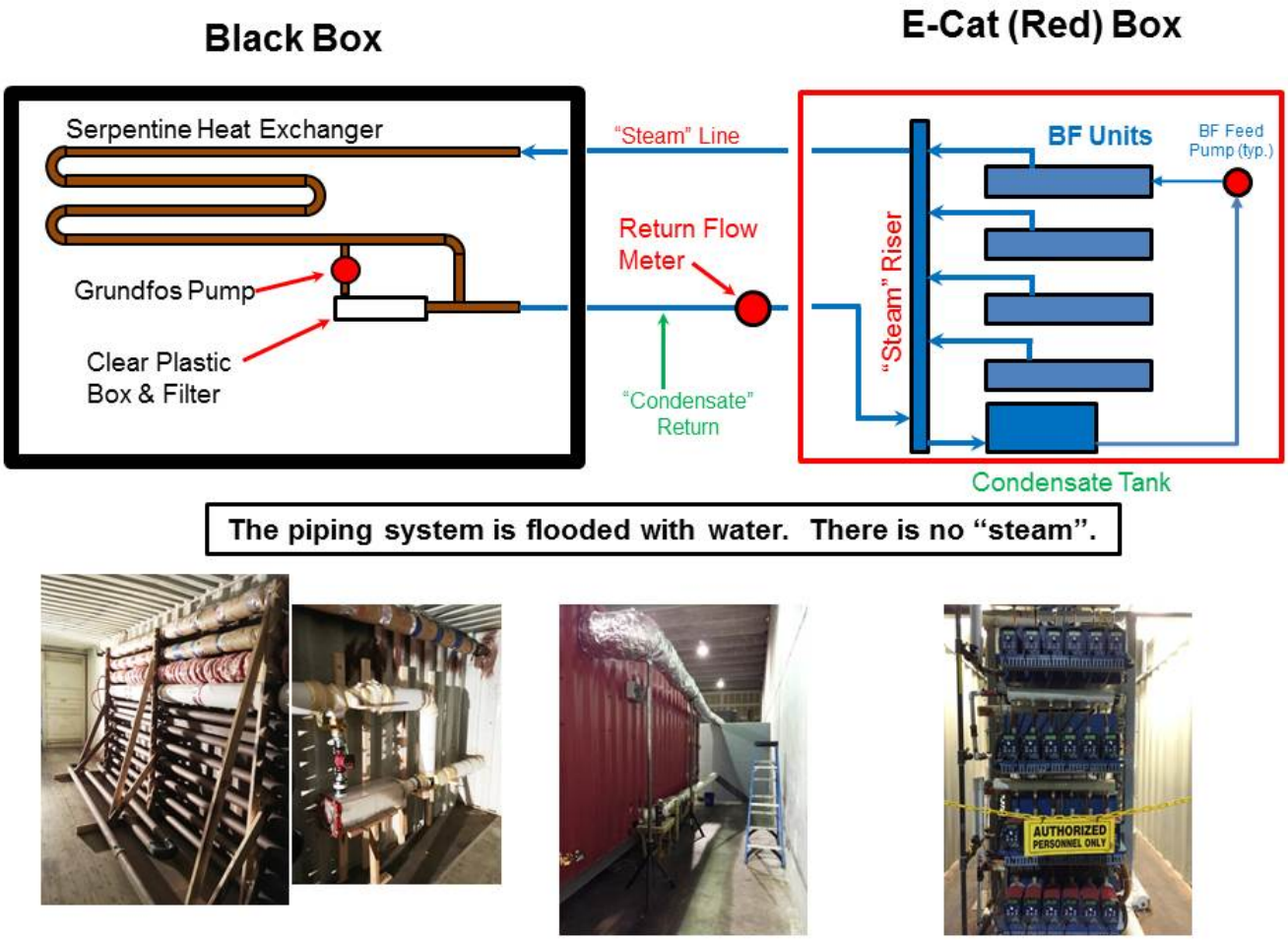
It is the author's opinion that the water flow numbers found in Mr. Penon's report were not generated by condensate returning from the black box. The alleged "steam" and condensate system was in reality a hot water flow circuit using the Grundfos pump to circulate the water through the piping and the water meter.

In fact, there were two water flow circuits. In the "Feedwater Flow" section above, the combined output of the E-cat feedwater pumps is 768 liters per hour, which is equal to 3.38 gallons per minute. This flow was through the BF feed pumps, through the BF units, to the "steam" line, down through the vertical riser, into the return tank, and back to the feed pumps.

The second circuit was from the E-cat "steam" riser, to the serpentine coil in the black box, through the Grundfos pump at the coil outlet, through the water meter (which was the basis for Mr. Penon's "steam" output numbers), back to the steam riser, and back to the E-cat return tank.

Commingling of these two flow streams is obvious as the "steam" riser is common to both flow circuits.

These are shown below.



In short, the alleged "steam" system was, in reality, a hot water system disguised to look like a steam system.

E – Cat Steam Superheaters

In Mr. Penon's report, he is reporting alleged steam temperatures that are slightly superheated. Superheated steam is steam that is heated above its saturation temperature. Please recall that when water and steam are in a boiler (which the E-cat is alleged to be), there is a very defined pressure temperature relationship. To quote from the author's first report:

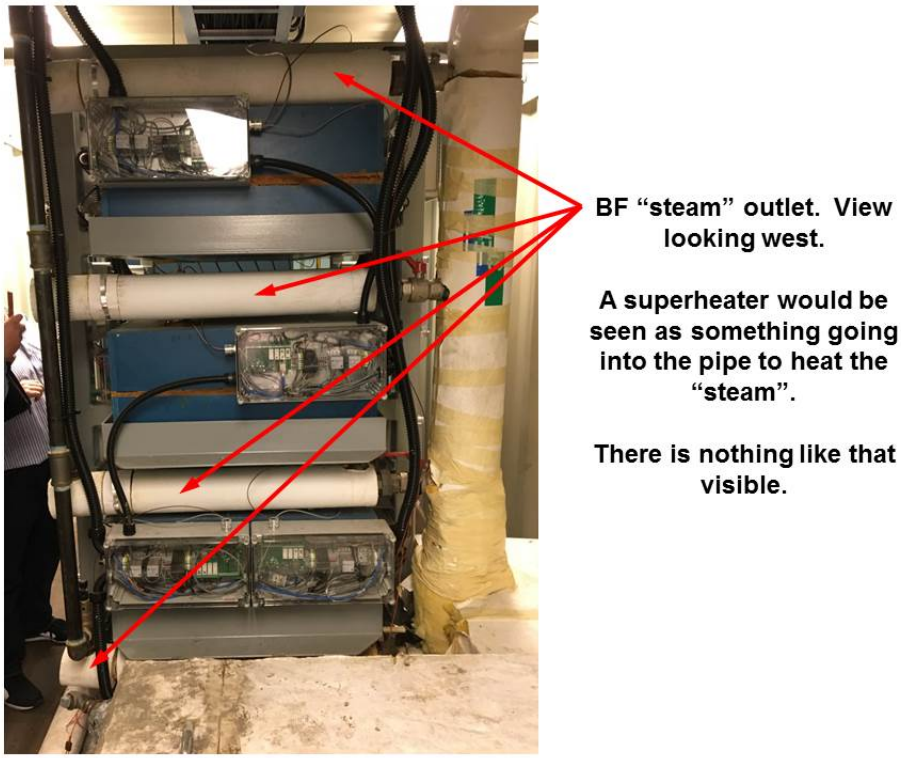
"Also, for any given fluid, the boiling temperature is dependent on the pressure the fluid is experiencing. Again, where liquid and vapor are in physical contact with each other, the temperature - pressure relationship for a given fluid is fixed and immutable. At a given pressure, the temperature of the fluid WILL be fixed by that relationship. And at that fixed temperature and pressure, there can be 100 % liquid, 100 % vapor, or any fraction in between. The horizontal red evaporation lines illustrate this concept.

Superheated steam (or any superheated vapor) is at a temperature above the saturation temperature for a given pressure. Obviously, the fluid is 100 % vapor, and there is no liquid present. Superheated steam is generated in a separate set of tubes which remove the steam from the liquid and then heat the steam to a temperature higher than the saturation temperature."

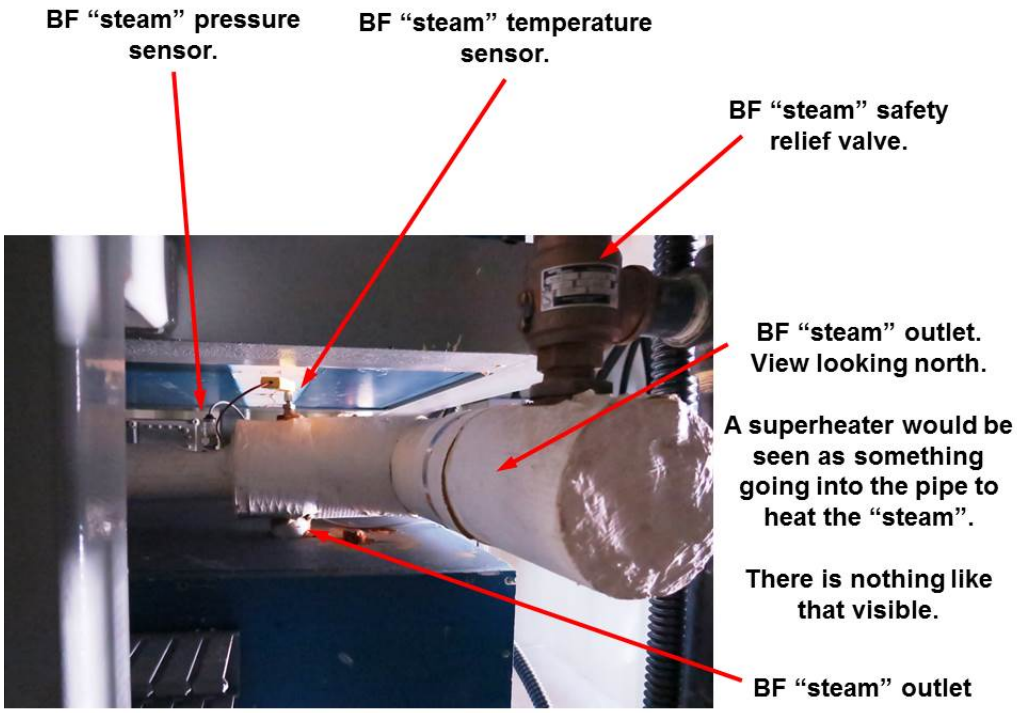
In the current case, the "steam" pressure is 0 bar, gauge (atmospheric pressure). The saturation temperature of the steam leaving the BF units is 100° C. To reach the reported temperatures of 103° C to 105° C, some type of superheater needs to be installed in the "steam" outlet. In point of fact, all steam superheaters are pipes which take steam from the boiler drum and heat the steam externally to the boiler drum.

The construction of the BF units precludes the use of internal superheaters. All the heating elements of the BF units are submerged in water, which means that they can only generate saturated "steam". Since there are no heating elements above the alleged water line, there can be no internal superheat. Are there external superheaters on the BF units?

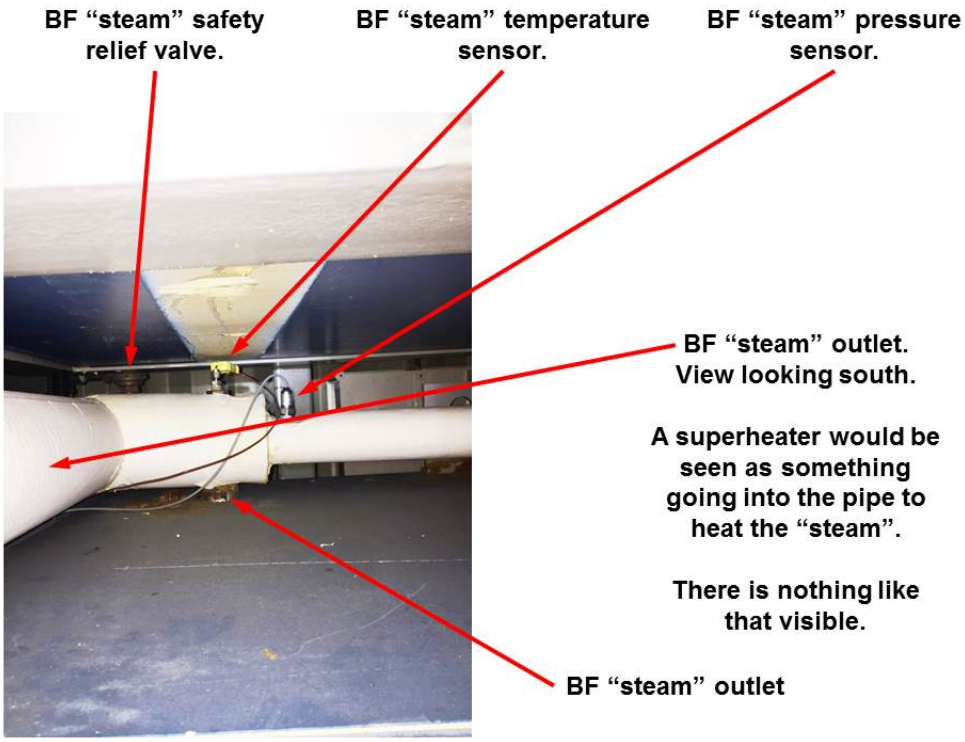
This picture shows the BF units looking from east to west.



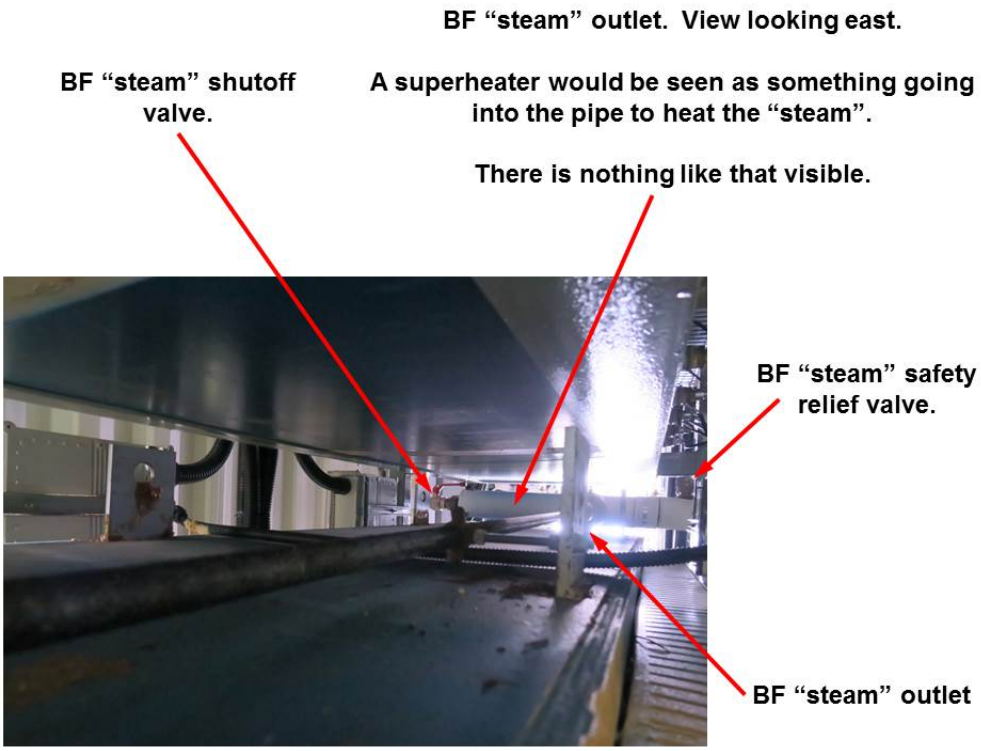
Looking from south to north.



Looking from north to south.



Looking from west to east.



As the photos of the BF units illustrate, there are no superheaters, thus there can be no superheated steam. Because of this, Mr. Penon's reported steam temperature numbers are not valid, thus his whole report is invalid.

Conclusions

Based on the preceding and my more than forty years' experience as a professional engineer engaged in facility and utility engineering and operations, it is within a reasonable degree of engineering certainty that I conclude the following:

1. There was no steam flow from the E-cat to the black box, based on both a pressure difference analysis and a heat transfer (temperature difference) analysis. In fact steam flow (other than de minimus amounts to warm the piping) was impossible with the configuration at the time of the validation period. Thus, any steam flow numbers appearing in Mr. Penon's report are not valid, therefore the whole report is invalid.
2. If there were a heat exchanger and cooling fans in the mezzanine, there is absolutely no physical evidence of their existence.
3. Because of anomalies in the reported data which violate the laws of thermodynamics, and major discrepancies between Mr. Fabiani's data and Mr. Penon's data, the data reported by Mr. Penon must be viewed with extreme skepticism.
4. Only the four BF units were running during the majority of the validation period. At times, some units were down for repair or maintenance. Their combined maximum "steam" output is 482 KW thermal. Despite this, Mr. Penon reported significantly higher produced energy numbers for the entire test. It is the author's opinion that the produced energy numbers in Mr. Penon's report are incorrect and therefore, his entire report is invalid.
5. It is the author's opinion that the water flow numbers found in Mr. Penon's report were not generated by condensate returning from the black box. The alleged steam and condensate system was in reality a hot water flow circuit using the Grundfos pump to circulate the water through the piping and the water meter. Because of this, any "steam" flow numbers in the Penon report are fictitious and the whole report must be invalidated.
6. As the photos of the BF units illustrate, there are no superheaters, thus there can be no superheated steam. Because of this, Mr. Penon's reported steam temperature numbers are not valid, thus his whole report is invalid.

III. FACTS AND DATA CONSIDERED

In forming the opinions expressed in this report, I have relied on my education and experience as described in my curriculum vitae which was attached as Exhibit A in my previous report. In addition, I received and considered the documents and information identified in Exhibit B in my previous report, as well as data gathered during my visit to the Doral site on 02 Mar 017.

IV. EXHIBITS THAT SUMMARIZE OR SUPPORT OPINIONS

I have not prepared any exhibits to summarize or support my opinion, other than as incorporated in the text of Section II above. I reserve the right to prepare exhibits in connection with my anticipated testimony at trial, after the completion of discovery.

V. QUALIFICATIONS

A summary of my qualifications is provided in the CV attached as Exhibit A in my previous report, which includes a list of all publications I have authored in the previous 10 years.

VI. EXPERT WITNESS EXPERIENCE

Since January 2012, I have testified as an expert at trial or deposition in the following matters:

1. I provided my expert opinion in *Jerew v. Rhodes Heating*, Case No. 11-CV-0876, in the County Court for Marion County, Ohio, and testified at trial in December 2012.
2. I provided my expert opinion in *Akron Fairlawn Properties v. Edgell Plumbing*, Case No. 2012-09-5199, in the Court of Common Pleas for Summit County, Ohio, and testified at deposition and trial in October 2013.
3. I provided my expert opinion in *Richmond v. Sears Roebuck, et al.*, Case No. 12-CV- 010718, in the Court of Common Pleas for Franklin County, Ohio, and testified at deposition in December 2013.
4. I provided my expert opinion in *Young v. First Energy*, Case No. 2013-CI-0408, in the Court of Common Pleas for Coshocton County, Ohio, and testified at deposition in April 2015.

VII. COMPENSATION

I am being compensated for my work in these proceedings at a rate of $275.00 per hour, except that my rate for deposition and trial testimony is $375.00 per hour. My compensation is not dependent on the opinions rendered or the outcome of this proceeding.

By: 

20 Mar 2017
Rick A. Smith

Respectfully submitted,

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CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a true and correct copy of the foregoing was served by e-mail on counsel of record this 20th day of March, 2017.

/s/ Christopher Lomax
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