Executive Summary of Defkalion Technology Review

By [redacted]

Observations

1. I found everyone at Defkalion including John Hadjichristos and his lab assistants very cooperative with all aspects of the testing. Everything that I asked them to do was done without hesitation. I was allowed to bring in an independent set of thermocouples and data logging system to capture my own readings of the temperatures of the input and output fluid circuits through the Defkalion as an independent verification of their laboratory temperature measurements. My measurements varied from Defkalion's temperature measurements by only tenths of a degree.
2. The first day of testing, they were able to show me that the computed output of the system versus the input power used to drive the system was between 1.4 and 1.5 as calculated by their LabVIEW software. This was based on assumptions that they were making about the heat of vaporization of the 30% glycol mixture that they were using. Post test, there was a question about the actual thermal characteristics of the fluid they were using. So, I brought a one liter sample back to [redacted] with me to have characterized by a materials expert volunteering to help. There were also some questions about the accuracy of the flow rates. Finally, in case there were any questions about the calculations being used anywhere in the LabVIEW software, I had them provide me a copy of the LabVIEW project files they were using for this test.
3. On the second day of testing I had them charge the reactor with Argon to show the dependence of the reaction on hydrogen gas. As predicted by Defkalion, the argon (blank) run produced significantly less output than when charged with hydrogen. The COP was <1. Also a quick test was done to see if the instrumentation system was properly reading the input power and calculating the output power by using a set of resistive heating elements mounted on the wall of the laboratory for this purpose. This demonstrated that the instrumentation system was performing as expected and the data obtained on this run matched data obtained from the same test having been performed previously.
4. Before leaving for this trip, it was stressed to me that I should observe this system without allowing the system to produce steam. After the third and final day that I was there, it became very clear to me that this test apparatus was not designed to operate in a single phase with the thermal fluid mix being used. They used a mixture of 30% EG (Glycol) and 70% water for my first two days of testing. I had them use 100% water in the last day of testing. In spite of the inability to maintain a single phase, I believe the measurements of the flow meter was located far enough away from the reactor to be unaffected by the back pressure of the thermal fluid as it flashed upon entering the reactor. The water feeding the reactor on the last day came directly from the water grid of Athens ensuring that a constant positive pressure was maintained through the flow meter all the way to the reactor. There were no bubbles observed in the water flowing to the reactor. For the third and final day of testing, Defkalion, chose to trigger the hydrogen reaction much more aggressively than was done on the first day. Upon a preliminary look at the data, **the reactor was operating well in excess of a COP of 3.**

Conclusions

1. **Defkalion was able to demonstrate an excess of energy.**
2. **They were able to demonstrate that they canfully control the reaction: starting it, stopping it, increasing and decreasing it.**
3. **They were able to demonstrate that the reaction is dependent on hydrogen gas.**
4. **The contents of the reactor were removed and weighed to be 59 grams of mass, most of which was a ceramic encasement. Therefore, the reaction appears to produce more energy than a chemical reaction from a known amount with an equivalent mass; implying a nuclear reaction is involved.**
5. **There were error bands associated with all data obtained which have not yet been completely established. These will need to be addressed in a detailed analysis of this data.**
6. **It is my opinion that Defkalion is sincerely attempting to accurately measure and demonstrate the performance of their technology with confidence that they can achieve a COP >1 for a long enough period to exclude any possibility of a chemical reaction.**

Recommendations

1. **Defkalion needs to test their apparatus in a configuration that provides an optimal COP without concern that steam is generated. The internal reactor performs best when it can be triggered above a temperature of 310 degrees C. Testers need to be advised to bring the appropriate apparatus to handle proper measurement of the energy from steam if necessary. A thermal fluid with a boiling point above 250 degree C may also be used if the piping and reservoir material in the lab can accommodate this temperature safely. Also, the system may be sealed to allow a build-up of pressure to raise the boiling point of the thermal fluid.**
2. **Defkalion needs to maintain a flow rate through the reactor high enough to be above the lower limit of measure of the flow meter used. Since the flow meter was reading at its lower limit I manually calibrated the flow meter to compare accumulated flow as measured by LabView with what I measured with a stop watch and a scale. For a total mass flow of 758 ml over five minutes two different times, my manual approach with a stop watch and a scale was different from LabVIEW by only 61 ml the first time and 58 ml the second time.**