Defkalion Green Technologies

Site Visit by National Instruments, July 8 to 11, 2013

Draft Phase 2 Site Visit Report

July 13, 2013

Contents

1 Background and Objectives

Defkalion Green Technologies (DGT) has been developing a potential new source of energy that may be based on low energy nuclear reactions. The DGT energy production device is referred to the "Hyperion" reactor. National Instruments (NI) and DGT have been discussing the possibility of marketing cooperation. A visit was made by Stefano Concezzi, NI Vice President, to DGT in May, 2013. Subsequently a schedule was proposed for a site visit by the NI team for the week of July 8. A "Proposed Trip Plan" was sent to DGT by NI on July 7, 2013. The site visit commenced on July 8 and continued through July 12, 2013.

The objectives of the site visit were stated in the Trip Plan were to address several major topics including the following:

- Measurement and Protocol Assessment
- Measurement Software
- Calorimeter Assessment and Support
- Visit of Dr. Truchard

The purpose of this Trip Report is to document the location and attendees at the site visit, the experimental setup, the activities that took place, and NI conclusions.

2 Location and Participants

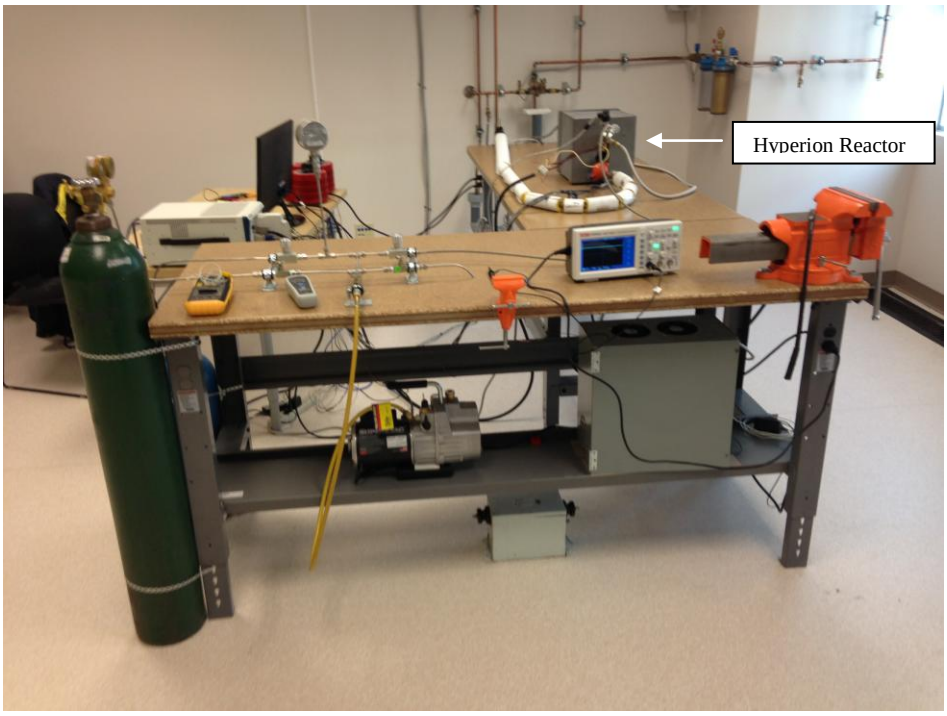
The site visit took place at DGT facilities at the University of British Columbia, Vancouver, BC. The Hyperion reactor and associated equipment are on the second floor of the Donald Rix building on the university campus. The participants were as follows:

NI	DGT
Stefano Concezzi, Sponsor	John Hadjichristos, Leader
Lothar Wenzel, Leader	Symeon Tsalikoglou
Arun Veeramani	Finlay MacNab
Brian Glass, Software Engineer	Ted Colletis
Tom Grimshaw, Reporting	Robert (last name not recorded)

Although Stefano and Arun were not onsite during the site visit, they were readily available for consultation and guidance. Several contacts were made with Stefano in particular regarding critical issues as they emerged.

3 Experimental Setup

The experimental apparatus is shown in the two photos below. The central component is the Hyperion reactor. The model being tested is the R5. According to DGT, model R6 is currently under development.



4 Site Visit Activities

Activities related to testing of the Hyperion reactor and associated equipment took place each day of the week of July 9 to 12, 2013.

4.1 Day 1, July 9

- Lothar Wenzel (LW) and Brian Glass (BG) arrived at DGT about mid-day. Tom Grimshaw (TG) arrived about two hours later.
- Finlay MacNab (FM) gave a detailed description of the experimental setup first to LW and BG and later to TG.
- John Hadjichristos (JH) operated the reactor tests with hydrogen assisted by FM and Ted Colletis (TC). LW and BG worked closely with JH as the tests were being conducted.
- Visits were made to the lab during the day by Robert (last name not recorded) and Symeon Tsalikoglou (ST) during the day, but they were not actively involved in the tests. TG made notes on the activities and took videos and photos of the equipment and test operations. Subsequently, he also took temperature measurements at selected points and made measurements with Geiger counter.
- The decision was made to continue to run tests with DGT's LabVIEW code rather than NI's improved version that was developed before the visit. This was to ensure that DGT could run the test in accordance with their established procedures.
- With JH observation and concurrence, LW made a few additions and changes to the DGT LabVIEW code for data processing, presentation, and logging.
- A second test with hydrogen was performed with LW software changes. JH reported a COP of 1.3 at the time data were collected. LW analyzed the data in the evening and found a COP of 1.0.
- Program freezing was observed but was found not to affect the test performance or data collection. (The freezing problem was further investigated on Day 2).
- The reactor then ceased to perform properly, apparently because of loss of pressure, and activities were discontinued for the day. Plans called for reconditioning the reactor (restoring the seal) for testing the next day.
- JH requested that changes or additions to the DGT software or procedure be documented in accordance with the DGT protocol.

4.2 Day 2, July 10

- Conducted detailed tour of the experimental setup with iPad video, with FM as moderator. Introduced other participants during the video.
- JH attempted to initiate a test with argon rather than hydrogen in the reactor as a form of calibration run.
- Program freezing again and was further investigated and diagnosed. The freezing was found to be caused by corrupted data from the power meter sensor. The sensor was reading correctly, but the data was being corrupted by electromagnetic radiation from the

spark plugs in the reactor. The program was fixed by making it continue to run when bad data were received from the power meters.

- Three separate runs at temperatures of about 27C, 50C, and 98C (outlet water temperatures) were conducted to check the volumetric measurements of the flowmeter. The first two runs showed consistency of the flowmeter with the bucket test. The third result showed deviation due to steam generation in the reactor.
- The decision was made that DGT's LabVIEW version would be run until a successful argon test is accomplished, and the improved NI version would then be implemented.
- During the lunch break, contact was made with Arun Veeramani to request assistance in gaining improved cooperation during the tests.
- Late in the day, a final calibration test with argon was performed with a COP of <1.0.

4.3 Day 3, July 11

- In response to concerns expressed by LW, SC contacted ST to make it clear that the NI team needed full cooperation with its requirements to evaluate the system. This included the ability to work without interference and perform independent verifications outside the DGT standard protocol.
- Morning discussion took place between BG, LW, TG, ST, and JH to clarify the points above. It was decided that hydrogen testing would be performed first under the standard DGT protocol with DGT software. Further testing would be performed with guidance from the NI team using the new software.
- The first test proved unsuccessful and was attributed to dirt clogging the flowmeter. The flow calorimetry water filter was replaced and the flowmeter was disassembled and cleaned.
- Additional tests were also unsuccessful and attributed to the following problems:
    - Continued freezing of the program, which was quickly fixed by BG
    - Clogging of the flowmeter
    - Improper operation of the flow control valves
    - Inaccurate readings from the flowmeter
    - Input power leakage
    - Tripping of the electrical input circuit breakers
    - Allowing the reactor to reach temperatures much higher than operational, resulting in failing of the seal and leakage of hydrogen
- JH determined that testing could not continue until the flowmeter and reactor gasket were repaired or replaced. LW offered to stay as long as required to perform additional testing, but it was decided that the NI team would return to Austin, as JH was not be able to determine a timeframe for ensuring proper operation of the reactor.

- The NI team made several offers to provide DGT with changes made to software and test procedures in accordance with DGT protocol. JH declined these offers on account of the fact no successful tests were performed.

4.4 Day 4, July 12

- ST arrived at hotel early in the morning to pick up flash drive with videos, which was provided.
- Discussions were held over coffee about the events of the preceding days of the tests.

5 Conclusions

Several conclusions were reached by the NI team during and immediately after the four days of the tests.

- Analysis of the Day 1 data (the only reliable data collected) showed no excess power production by the Hyperion reactor.
- Overall, the tests were not successful in establishing that the Hyperion reactor performs reliably and consistently.
- A number of operational problems interfered with successful testing of the reactor, ad detailed above.
- The DGT leader, JH, was unwilling to allow operation of the reactor setup by anyone except himself, in spite of evidence that others, such as FM and TC, had capability and experience in doing so. Lack of independent operation under the general supervision of the leader was a significant problem in the test procedure.
- With respect to the topics listed in the Background and Objectives, the following conclustions were reached.
    - Measurement and Protocol Assessment. The measurement and protocol could not be properly assessed because a successful test could not be run. The lack of independent operation of the experiment appears to be a clear deficiency.
    - Measurement Software. The DGT LabVIEW code was observed to be deficient. Certain changes were implemented to make remove minor bugs, such as to prevent freezing of the software. The improved LabVIEW version developed before the site visit could not be implemented because of the inability to achieve a successful test.
    - Calorimeter Assessment and Support. Steam production, flowmeter measurement fluctuations, flawed data analysis, and program deficiency resulted in improper determination of reactor performance.
    - Visit of Dr. Truchard. The results of the site visit were communicated to Stefano Concezzi.