

DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION
Field Observation Report: Stack Testing

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|--|---------------|--------------------|
| Facility: Michigan Power Limited Partnership | | SRN / ID: N4975 |
| Location: LUDINGTON | County: MASON | District: Cadillac |

| | | |
|-------------------------------------|-------------|-----------|
| Permit(s): MI-ROP-N4975-2014 | | |
| <input type="button" value="Save"/> | | |
| Contact (s): | Staff (s): | Date (s): |
| Brooke Gillespie - Lead Tester | Jeremy Howe | 10-21-14 |
| Patrick Gillespie - Tester | | 10-22-14 |
| Becky Sparks - Facility | | |

| | |
|---|---|
| ACTIVITY: | |
| <input type="checkbox"/> Pre-Test Site Visit/Monitoring | <input checked="" type="checkbox"/> Relative Accuracy Test Audit (RATA) |
| <input type="checkbox"/> Performance Specification Test (PST) | <input type="checkbox"/> COMS Performance Test Audit |
| <input type="checkbox"/> Cylinder Gas Audit (CGA) | <input type="checkbox"/> Visible Emissions Observation |
| <input type="checkbox"/> Photos Taken | <input type="checkbox"/> Other |

This was an Relative Accuracy Test Audit (RATA) at Michigan Power Limited Partnership (MPLP) located in Ludington, Mason County on October 21+22, 2014 for the following parameters:

| Emission Unit / Flexible Group | Monitor | Subject to | Method ¹ | PS ² | Monitor Unit | RATA Unit | Load ³ |
|--------------------------------|-----------------|--------------------|---------------------|-----------------|-------------------|--------------------------------------|-------------------|
| FGTURBINE/HRSG | NO _x | 40 CFR 75 Appx A,B | 7E, 3A, 19 | - | ppm _{vd} | lb/mmBtu | High |
| | O ₂ | 40 CFR 75 Appx A,B | 3A | - | % | % | High |
| | NO _x | Part 55 Rule 1150 | 7E, 3A | 2 | ppm _{vd} | ppm _{vd} @15%O ₂ | - |
| | CO | Part 55 Rule 1150 | 10, 3A | 4/4A | ppm _{vd} | ppm _{vd} @15%O ₂ | - |
| EUBOILERA | NO _x | Part 55 Rule 1150 | 7E, 3A, 19 | 2 | ppm _{vd} | lb/mmBtu | - |
| EUBOILERB | NO _x | Part 55 Rule 1150 | 7E, 3A, 19 | 2 | ppm _{vd} | lb/mmBtu | - |

¹40 CFR, Part 60, Appendix A

²Performance Specification in 40 CFR, Part 60, Appendix B

³As defined in 40 CFR, Part 75, Appendix A, Section 6.5.2.1(b)

ppm_{vd} = parts per million by volume on a dry gas basis

ppm_{vd}@15%O₂ = parts per million by volume at 15 percent oxygen and on a dry gas basis

lb/mmBtu = pounds per million British thermal units

The following individuals were involved with the test:

DEQ

Jeremy Howe – Cadillac 231-876-4416 howej1@michigan.gov

Stack Testers – Environmental Stack Testing (EST)

Brooke Gillespie (Wolschleger) – Qualified Individual – 616-828-2754 environmentalstacktesting@gmail.com

Patrick Gillespie – Running Analyzers

Brian – Moving Probe

Facility

Becky Sparks – I&E Tech 231-690-7255 bsparks@camsops.com

Observations:

DAY 1

I arrived onsite at 0915

I had to sit through a training video this year because Becky would not be with me the whole day although she would be onsite somewhere. After the video, Becky and I went to the testing trailer which was in its usual spot between the stack for FGTURBINE/HRSG and the part of the building housing the two boilers. Brooke was the Qualified Individual, but Patrick was running the instruments. Brooke was leaving the trailer for various reasons all day, some related to the RATA and some not. Also, she was taking VE readings for some reason. 40 CFR, Part 75, Appx A, Section 6.1.2(e) states that a Part 75 RATA should be overseen by a Qualified Individual with "allowances for normal activities" such as bathroom breaks. It appeared that this was not happening at times, but I'm not sure how strict we as Regulators need to be, so I'm going to check into this at the next TPU meeting. To be sure, Brooke was in the trailer most of the time, she just seemed to be absent more than what I've seen from other Qualified Individuals.

I spent the first 30 minutes or so in the trailer talking with Becky about MPLP; ie, who the latest owner was, any changes in the last year, any changes in the coming year and the status with MPLP continuing to sell steam to OxyChem. After that I dug into the RATA on FGTURBINE/HRSG which was already 6+ runs in. I took down their cal data and initially thought there was a problem especially with the NOX instrument. This was confirmed once I started to enter their cal data into the spreadsheet on my phone. There was some disagreement between Brooke and me initially because they rent a program called STRATA which does all the calculations for the user and STRATA showed that they were passing whereas my calculations did not. I immediately figured out the problem when I looked at the STRATA printouts. All of the Method 7E cal checks are basically a percent difference calculation: $(\text{measured}-\text{actual})/\text{actual}$. The tester challenges the instrument calibration by not going through the sample line for each calibration gas (this is called Analyzer Cal Error or ACE), then through the sample line for the low gas (typically a zero) and one upscale gas (mid or high) (this is called System Bias or SB). The key to all of this is that ACE and SB divide by the calibration span which is the high gas concentration and not an "actual" in the classic percent difference calculation. ACE passing percent difference is limited to 2% and SB is limited to 5%. So everything can rely on what the high gas value (span) is since the cal checks get easier to pass with higher span concentrations. EST was using a high gas concentration of 25 ppm. My (or rather M-7E's) calculations were coming up with roughly 4x what STRATA was providing for the cal checks. I explained to EST that STRATA was either using a span concentration of 100 ppm or it was doing a straight difference calculation (measured-actual and not dividing or multiplying by anything). These were the only things that made sense mathematically.

After Run 9, Pat and Brooke dug into the settings on the computer for STRATA. I did not realize it at the time, but STRATA is also the data logger. As such the operator sets the range of the instrument in STRATA. The range sets the voltage for the data logger to record at. Thus, if a tester is anticipating concentrations of 50 ppm, they would set the range probably to be 1 volt = 100 ppm. STRATA therefore needs a range set to collect voltages to then in turn equate the voltages to ppm (once it is calibrated with cylinder gases). According to EST, STRATA uses the range as the span. EST set the range of 0-1 volts as 0-100 ppm in STRATA and STRATA then set the span as 100 ppm even though no gas was challenged at the level. I have no idea how true any of this is. STRATA was at one time a standard, commercially available program to neatly run gaseous stack testing events. At some point, many testers home grew their own version of STRATA so it is somewhat of an anomaly now. Thus, I can't imagine such a widely available and used program would have such a blatant error left to fester in it. However, I don't know of anyone else that uses it now so I can't really double check on it either.

Brooke, unfortunately, kept on insisting that I needed to tell her how STRATA was wrong and I needed to tell her how I wanted her to run the RATA. I continually reminded her that it wasn't how I felt the RATA should be ran, but rather if it was meeting the specifications in the CFR and in particular the cal checks in Method 7E. Furthermore, the calculations of a computer program did not trump the calculations in Method 7E. I did take it upon myself to try and call a couple of people in TPU, but no one was around. So, I went and let Becky know the situation and that all of us needed to have a meeting at which point Brooke walked in. I told them that they weren't making M-7E's cal checks and why and that I wasn't going to hear back from anyone in TPU for days possibly, so Becky and Brooke needed to make a decision. They decided to scrap the RATA and do a new one. I suggested using a cylinder more in line with what I have seen other testers use (around 100 ppm) which they had one at 95 ppm. I told Becky that MPLP would have to submit the scrapped RATA, but it didn't count against them since the instruments were not calibrated and to state as much in the report.

After that, there wasn't much excitement. EST did recalibrate the instruments using a higher span gas. While they did pass, the NOX instrument was close to failing checks. EST rents all of their equipment, so I felt limited in the troubleshooting that we could do since there is no telling where the instrument was last or look at other reports from them to see how it performed in past tests. I did make sure that the CEM and RM were using the same F-factor, rounding to the same number of digits and using the same times. Becky asked me if I wanted the process data reported in electricity or steam production. I told her to report whatever MPLP reports to ECMPs, which was MW I believe. She asked if a graph was fine as MW were not routinely reported in the DAS, which I said was fine. We just needed something to see if the turbine was running at its normal high load. I left after Run 6 with all monitors passing RA.

I left the site at 1730

DAY 1

I arrived onsite at 0930

Becky and I went out to the testing trailer. EST was running the RATA on EUBOILERA today. I asked for the final runs on FG-TURBINE/HRSG so I could finish the cal checks and determine the final RA. After that I started on the same items for EUBOILERA. These items are summarized below.

| Emission Unit / Flexible Group | Monitor | RATA Unit | RA | Runs | Limit |
|--------------------------------|-----------------|--------------------------------------|-----|------|--------|
| FGTURBINE/HRSG | NO _x | lb/mmBtu | 6.1 | 9 | 7.5 |
| | O ₂ | % | 3.9 | 9 | 7.5 |
| | NO _x | ppm _{vd} @15%O ₂ | 6.5 | 9 | 20 |
| | CO | ppm _{vd} | 0.4 | 9 | 5 ppm* |
| EUBOILERA | NO _x | lb/mmBtu | 2.3 | 6 | 20 |
| EUBOILERB | NO _x | lb/mmBtu | - | - | 20 |

*5 ppm_{vd} when the RA is calculated as the absolute average difference between the RM and CEMS plus the 2.5 percent confidence coefficient

Staff:

CC:

Date: