

DEPARTMENT OF ENVIRONMENTAL QUALITY  
AIR QUALITY DIVISION  
ACTIVITY REPORT: Scheduled Inspection

N698923641

FACILITY: AVL POWERTRAIN ENGINEERING		SRN / ID: N6989
LOCATION: 1801 E ELLSWORTH RD. ANN ARBOR		DISTRICT: Jackson
CITY: ANN ARBOR		COUNTY: WASHTENAW
CONTACT: Steve Plewa , EH&S/ Quality Coordinator		ACTIVITY DATE: 11/13/2013
STAFF: Diane Kavanaugh-Vetort	COMPLIANCE STATUS: Compliance	SOURCE CLASS: MAJOR
SUBJECT: Conducted complete scheduled compliance inspection. Title V Source. FCE. Renewal application in-house. Performance test conducted and AQD observation on the same day.		
RESOLVED COMPLAINTS:		

AVL contact: Steve Plewa, Environmental Health & Safety Coordinator, 734-368-4087, email: [steve.plewa@avlina.com](mailto:steve.plewa@avlina.com)

On November 13, 2013, the AQD conducted a complete scheduled Full Compliance Evaluation (FCE) inspection of the AVL Powertrain Engineering facility located in Ann Arbor. The inspection was scheduled ahead in order to coordinate observation of the required performance testing being conducted on this date. The purpose of the inspection was to determine AVL's compliance with the federal and state applicable requirements, including Act 451, Part 55, Air Pollution Control regulations and conditions of their Renewable Operating Permit (ROP) MI-ROP-N6989-2009a. AVL's Renewal application is in-house and is undergoing technical review. The last PTI revision was to add the ability to conduct engine testing with natural gas fuel. It was incorporated by Minor Modification. Performance testing is required within 180 days of commencing this operation. AVL is within that time period.

Upon my arrival in the area of the facility, and prior to my entering the property, I conducted a short duration informal visible emission (VE) observation of the facility and exhaust stacks. I did not observe any VEs from the roof stacks associated with the twenty (20) Engine Dynamometer Test Cells. I am currently certified in USEPA Method 9 for conducting observations of opacity (VE). The weather conditions at the time of my inspection: temperature in upper 20's to low 30's, clear sky and sunny.

Upon my arrival on site, I entered the main lobby and met with contact Steve Plewa who's responsibilities include two separate facility locations, the other is in Plymouth (Wayne County). Steve met me and I signed in. He has been the environmental contact for AVL for many years at this location and is familiar with the format and purpose of the AQD inspections. Steve and I discussed the current items involving the ROP. It is noted AVL's 2012 MAERS was submitted timely and I conducted a cursory review prior to the inspection. Emission calculations and supporting documentation for the 2012 calendar reporting year were submitted. AVL's required ROP Semi-annual and Annual Certification and Deviation reports were submitted timely and reported No Deviations for the 2012 to 2013 periods.

2012 MAERS reported Diesel usage 29.68 E3 gallons, uncontrolled testing using gasoline 12.50 E3 gallons, and Zero reported controlled gasoline testing. No natural gas fueled testing was conducted. Total 12 month rolling fuel usage for month ending December 2012 = 42,186.

AVL's ROP for FGTESTCELLS limits total fuel usage per 12 month rolling period to 392,692 gallons. Therefore AVL was in compliance with this limit for year ending 2012. The resulting 12 month rolling emissions reported were: CO 31.8 tons; NOx 5.8 tons; VOC totaled about 1 ton and limit is actually for 1,3 butadiene and emissions were 0.017 < 0.063 limit.

**FG-TESTCELLS:** During the inspection Steve provided me with records of AVL's Monthly Fuel Usage (gallons) and emission calculations required by the current ROP through October 2013. The records are attached to this report and are placed in the AQD file for the facility.

Total gasoline and diesel usage: Again, Limit is 392,692 gallons per 12 month rolling time period as determined at end of month. Records for month ending Oct 2013 = 47,684 gallons

Total gasoline usage: Limit is 150,000 gallons (same period). Records for month ending Oct 2013 = 11,793 gallons

Uncontrolled gasoline usage (without Catalyst): Limit is 34,500 gallons (same period). AVL is taking the conservative approach and is considering all testing as "uncontrolled". They are far below all fuel limits therefore this approach is acceptable to AQD at this time. Same as Total gasoline usage: = 11,793 gallons

Natural gas usage: Limit is 25.65 MM ft3. (same period) = 1.326 MM ft3

FG-TESTCELLS records show 12 month rolling emissions as of Oct 2013 are compliant:

1,3 Butadiene = 1.61 E-02 tons < LIMIT of 0.063 tpy when using gasoline

Lead = 7.06 E-04 tons < LIMIT of 0.6 tpy

CO = 30.55 tons < LIMIT of 127.5 tpy

NOx = 8.38 tons < LIMIT of 91.2 tpy

AVL's emission limits are tied to Fuel Usage limits and Emission Factors based on performance testing. EF's are also referenced in ROP Emission Limit Table. The previous performance test was conducted April / May 2005. (Copy of ROP is attached to this report to file)

The reason for the last PTI revision (and subsequent issued Minor Modification) was to add the ability to use natural gas fuel for engine testing. AVL's ROP now includes a natural gas fuel limit and natural gas emission factors. The performance test requirement in Condition V.1. of FG TESTCELLS is being conducted today. Condition requires AVL test one dynamometer within 180 days after commencement of trial operation with natural gas. Today's testing is primarily in response to this requirement.

### FACILITY INSPECTION

AVL operates engine test stand dynamometers (no Chassis Dynos). The testing profiles conducted are primarily research and development performance, durability, and emissions certification on engines and engine components supplied by outside manufacturers. They have 10 rooms or "Cells". Within each Cell are two Engine Dyno Test sites/stands. In the ROP the Cells are numbered 1-20 and combine into Flexible Group FG-TESTCELLS. AVL actually labeled the Cells with numbering started at their Plymouth facility and continued here so #1 is actually labeled #8 and counts up from there. I asked Steve how many Cells were operational today. He consulted with the Testing Manager of this location and they estimated about 7 Cells are operating or are set up to operate at this time. About 4 of these are operating on diesel and the rest are gasoline. They only have the one Cell #13 set up to run Natural Gas at this time. Their primary customers are Chrysler (testing gasoline engine) and Honeywell (testing the Turbo on a diesel engine).

AVL primarily tests Diesel Engines which are all uncontrolled (without catalyst). They do conduct gasoline testing and have limits on how much of this testing may be uncontrolled (without catalysts) and controlled (with catalysts). See earlier discussion of limits.

Steve accompanied me during a walk through inspection of the facility including the Engine Testing corridor. I observed the outer corridor of the Battery testing area. This was implemented in 2009. Steve explained back then AVL had an initial contract but since that was completed they have had limited work in this area because many auto companies conduct this research/testing themselves. This is the same status as of today. Steve has not pursued any AQD applications or notifications since no fuels are used. To my knowledge at this time there are no Rule 201 permit or other applicable requirements for battery testing.

During the prior inspection I observed another Cell located in the Battery corridor and Steve had explained it is used for Transmission testing without fuel and I observed there was no exhaust. I did not inspect this Cell today.

During the inspection today, I spent significant time observing the Natural Gas performance testing, in Test Cell #13. (See Performance Testing Section details below) Steve and I spoke to the Operator /Technician at the Cell controls. AVL was conducting testing of a Single Cylinder development engine. Protocol was set to run between 1200 rpm to 2400 rpm. AVL described to me that natural gas engine testing is very different than gasoline engine testing in that they can work with a single cylinder and apply that data to the entire engine. An AVL Emissions Bench was set-up and operating on this Cell. The operator said the data is not being recorded however. We discussed tying this data to the control panel data recorder so that it can be part of the testing run operational data recorded for the test report. Unfortunately the second test run had started by this time and the operator explained it needs to be set up prior to running the test protocol program.

AVL agreed to set up recording the emissions data for the final Run #3. Therefore we will have one of three runs with AVL's emission monitoring data. I was also made aware that the Emission Bench is not standard on every Cell because many Cells are used for other types of testing where its not needed or relevant. It takes many hours to set up /ready the Bench to run. At this time, they don't have one set up for the other two Cells that will be running Gasoline or Diesel performance testing. There is not enough time now since this testing is to take place today.

During the last natural gas test run I wrote down digital readings I observed on the Emission Bench. NOx @2400-2450 ppm; TAC's @ 1500 ppm; and CO had large swinging range so I did not record it.

Following the inspection, I asked Steve for an update on their Monitoring and Preventative Maintenance Plan for the catalysts on Engine Testing - gasoline controlled. ROP Condition III. 1. contains this applicable requirement. The Catalytic Converters are indicated in the permit to be 90% efficient and therefore this is the control efficiency allowed to be used in AVL's calculations. Received updated Plan by email on 12/5/13. Temperature at inlet and across catalyst is primary monitoring parameter to ensure minimum 90%. Added additional measure of monitoring temperature before and after catalytic control. Acceptable Plan and copy will be placed in plant file and referenced as part of ROP.

I observed AVL's one paint booth. It is equipped with filters and exhaust stack and uses only Aerosol cans per Steve. It is located in the maintenance area. I observed there is an Aerosol can puncturing / disposal container. This process appears to qualify for Rule 201 exemption pursuant to Rule 287(b).

AVL is currently a true minor source of HAPS. I noted that AVL's Renewal contained applicability to a newer Area Source MACT requirement. Specifically, EPA issued clarifications to the Gasoline Dispensing Area Source MACT stating it was always intended to apply to fueling Engine Test Cells/Stand. I verified that AVL does have USTs for gasoline and/or diesel. Area (Minor Source) MACT Subpart CCCCCC will be included as applicable requirement(s) in their Renewal.

During the inspection Steve and I walked around the outside areas of the building by the USTs and around the back of the building. AVL's USTs are numbered 1-5 however 2/3 and 4/5 are divided as indicated.

Regarding other Area Source MACT standards: Steve confirmed with me that AVL does not have any emergency generators (RICE MACT) or any boilers (Boiler MACT) on site. I did not observe any subject equipment during the facility inspection.

AVL continues to operate two Rule 201 exempt maintenance Cold Cleaners referenced in the ROP as FGCOLDCLEANERS.

### PERFORMANCE TESTING

Contracted Tester: Conestoga-Rovers & Associates, Inc. (CRA). Test lead on-site: Alex Kruse

Upon my arrival Steve informed me that the start of Natural Gas testing had been delayed. CRA / AVL determined that additional dilution air is part of stack design and it was not clear how to proceed. David Patterson, AQD Technical Programs Unit (stack testing oversite) was not on site yet (was on his way). CRA were able to consult him and others from TPU on whether to block off the openings or leave them as is for testing. They were informed that if that is "normal" design/operation then they can leave them as is, what AVL referred to as "uncapped". Earlier Steve had "capped" or taped off the excess air inlet area around the exhaust where the engine exhaust pipe meets the stack within the Dynamometer

Test Cell. He also capped another 8 inch hole further up the stack (on an upper floor). Both of these air inlets to the exhaust are downstream of (prior to) the stack test probe.

Dave Patterson arrived and it was determined that AVL could proceed with the Natural Gas testing with the exhaust as it normally operates, i.e. uncapped. The first test run started at 10 AM and ended at 11 AM; Run #2 started at 11:20 to 12:20 PM; and Run #3 started at 12:40 to 13:40 PM.

The Natural Gas testing was set up in AVL Dynamometer Test Cell #13; Gasoline testing was set up in Cell #11; and Diesel testing was set up in Cell #9. One set of testing equipment is being used and will be moved from Cell to Cell. This constitutes 9 hours of testing (not accounting for leak checks, set up, moving equipment, etc...). A different Engine will be tested in each Cell. The intent was to conduct all testing today but the following day was also reserved just in case.

The Natural gas testing concluded without incident and CRA/AVL prepared and moved the testing equipment to Cell #11 to commence Gasoline Testing around 2:00 PM. Steve explained that the engine they planned to use, a V8, was not available and they instead have a GM Impala 4 Cylinder set up in the Cell. He said they will run a protocol of a higher end durability type that is normal for their customers. This is @75% Throttle, 3000 rpm to 4000 rpm at about 1/2 hour at each. I agreed to this and AVL started to run the dynamometer /gasoline engine and CRA started sampling.

Immediately Alex stated that they were not reading any emissions of CO. He ran through all the appropriate QA/QC prior to the testing and David observed. Steve verified that everything was running normally at the Cell. AVL adjusted the RPM higher to see if that made a difference and it did not. CRA continued to obtain no readings. Steve then had them ramp down the engine while CRA checked all their lines, the stack probe, etc... It was then decided to shut down the Cell, let it cool and try "capping" off the excess air inlet openings as was done previously initially in the Natural Gas Cell. All of this took significant time. In addition Alex contacted others for advice and Steve also consulted with other AVL staff for help.

Gasoline performance testing was again started after the Cell was set-up with all excess air exhaust inlets capped. CO readings were immediately observed and recorded, and continued to climb to above the limits of the Calibration gas of 6000 ppm. Alex indicated a concern that over the duration of the testing CO might also exceed the limit of the analyzer equipment, which I believe he said was 20,000 ppm.

An additional attempt was made to test by removing only one of the two air inlet caps (the 8 inch duct opening was uncapped). This resulted in CO emission readings that went down from the very high levels when there were both "capped" inlets however under this scenario CO emissions were still high.

In the end due to the issue described and the lateness of the day, it was determined by all parties that no one had a clear explanation for the difference in emissions. It is known CO emissions are in the exhaust without the excess air, but why the instrumentation was obtaining no emission reading with excess air is unknown at this time. AQD agreed with AVL that the "capped" scenario is not representative of actual operation. However, AQD also can not accept a "0" CO emission test from an uncontrolled gasoline engine without further explanation, especially since the previous testing established an uncontrolled EF of 4.9 lb/gal and it *appears* the difference here is due to dilution.

#### COMPLIANCE SUMMARY

It appears that AVL Powertrain Engineering is in substantial compliance with their ROP conditions at this time. The AVL Renewal ROP application is undergoing technical review. The performance testing was completed for Natural Gas as required. Diesel performance testing was also conducted the day following the inspection. I spoke to Steve on that day by phone and was informed that Testing went without incident and readings were obtained similar to initial testing. Steve confirmed that AVL's existing exhaust duct set up with the excess air inlets has been in place since the facility was constructed.

AVL and AQD agreed that gasoline testing can be postponed until a later date due to the issue that occurred and is described in this report. The ROP may contain language allowing the testing to be conducted during the 5 year term. Additional investigation into the issue identified is needed.

NAME *Diana G. Helms*

DATE *12/10/13*

SUPERVISOR *S*

