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**FCA US LLC**  
**Warren Truck Assembly Plant**  
Warren, Michigan

# Final Report

## EG-BOILERS 3, 4, 5 and 6 Compliance Air Emissions Report for Nitrogen Oxides

RWDI # 1600241  
March 8, 2016

### SUBMITTED TO

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FCA US LLC – Warren Truck Assembly Plant (WTAP)  
 FINAL - Source Testing Program (NOx)  
 EG-BOILERS 3, 4, 5 and 6  
 RWDI #1600241  
 March 8, 2016

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## EXECUTIVE SUMMARY

RWDI AIR Inc. (RWDI) was retained by FCA US LLC (FCA) to complete air compliance testing on four (4) natural gas fired boilers at their Warren Truck Assembly Plant (WTAP) located in Warren, Michigan. The four boilers tested are referenced as the EG-BOILER3, EG-BOILER4, EG-BOILER5 AND EG-BOILER6. The purpose of this testing was to evaluate compliance with Nitrogen Oxides (NOx) emission limits specified by Renewable Operating Permit NO. MI-ROP-B2767-2011. The testing followed United States Environmental Protection Agency (USEPA) Test Methods 3A, 7E and 19.

Testing consisted of three (3) 60-minute test runs for nitrogen oxide emissions. The sampling was conducted from January 26<sup>th</sup> to 27<sup>th</sup>, 2016. Sampling was witnessed by Mr. Mark Dziadosz and Mr. Irana Konanahalli from the Southeast Michigan Air Quality Division of the State of Michigan Department of Environmental Quality. FCA representatives at the testing event were Mr. Stuart Duncan and Mr. Rohit Patel.

Results of the sampling program are outlined in the table below. Results of individual tests are presented in the Appendices.

Table 1: Nitrogen Oxide Emissions

Source	Run 1		Run 2		Run 3		Average	
	lb/MM Btu	lb/hr	lb/MM Btu	lb/hr	lb/MM Btu	lb/hr	lb/MM Btu	lb/hr
EG-GASBOILER3	0.0361	3.4	0.0354	3.4	0.0356	3.4	0.0357	3.4
EG-GASBOILER4	0.0616	4.5	0.0622	4.6	0.0633	4.3	0.0624	4.5
EG-GASBOILER5	0.0628	6.2	0.0639	6.5	0.0627	6.0	0.0631	6.2
EG-GASBOILER6	0.1427	13.3	0.1449	13.9	0.1476	13.7	0.1451	13.6

lb/MM Btu: pound per million British thermal unit  
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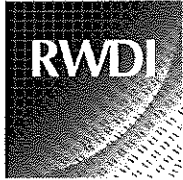
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- Appendix D: EG-BOILER4 Sampling Results
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- Appendix H: Calibration Gas Certificates of Accuracy
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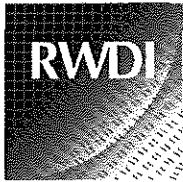
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lb/MM Btu: pound per million British thermal unit  
 lb/hr: pound per hour



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# 1. INTRODUCTION

RWDI AIR Inc. (RWDI) was retained by FCA US LLC (Chrysler) to complete air compliance testing on four (4) natural gas fired boilers at their Warren Truck Assembly Plant (WTAP) located in Warren, Michigan. The four boilers tested are referenced as the EG-BOILER3, EG-BOILER4, EG-BOILER5 AND EG-BOILER6. The purpose of this testing was to evaluate compliance with Nitrogen Oxides (NOx) emission limits specified by Renewable Operating Permit NO. MI-ROP-B2767-2011. The testing followed United States Environmental Protection Agency (USEPA) Test Methods 3A, 7E and 19.

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The notification of intent to conduct the air compliance testing was submitted to the Michigan Department of Environmental Quality on December 14<sup>th</sup> 2015. The quality assurance review of the test plan was completed on January 12<sup>th</sup>, 2016. Both the notification of intent letter and the quality assurance review letter as well as a copy of the RNOP is located in **Appendix A** of this report. Below is a table that summarizes test dates for each parameter tested.

**Table 2: Source, Parameter & Test Date**

Source	Parameter	Test Date
EG-GASBOILER3	Nitrogen oxides and oxygen	January 27, 2016
EG-GASBOILER4	Nitrogen oxides and oxygen	January 27, 2016
EG-GASBOILER5	Nitrogen oxides and oxygen	January 26, 2016
EG-GASBOILER6	Nitrogen oxides and oxygen	January 26, 2016



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## 2. SOURCE DESCRIPTION

### 2.1 Facility Description

WTAP is located at 21500 Mound Road in Warren, Michigan. The facility completes assembly and paint operations for Ram Trucks. The boilers tested produce steam and heat used during the automobile manufacturing process. The maximum capacity of the boilers varies from 50-70% of the full capacity. The rated capacity of each boiler is presented in the table below

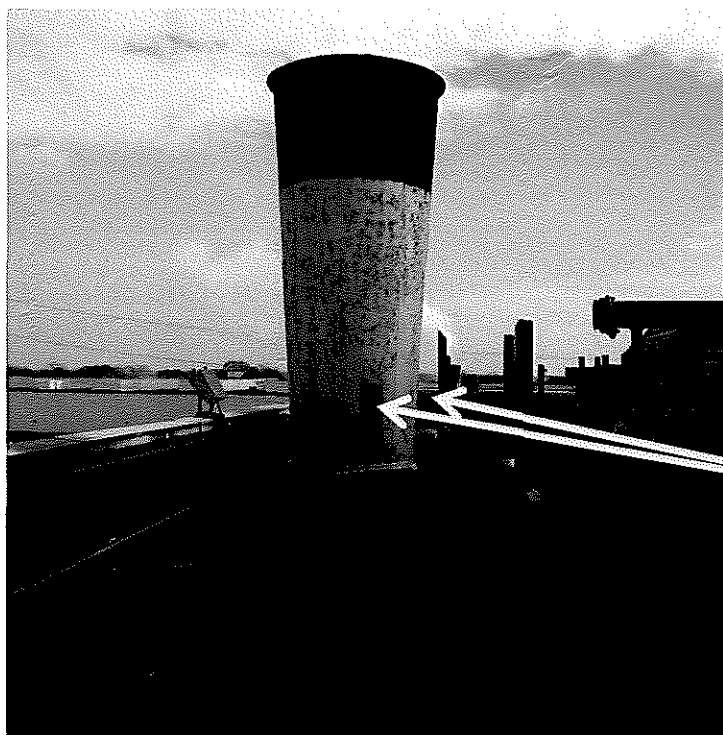
**Table 3:** Boiler Description

Boiler	Capacity	Pollution Control Equipment
EG-BOILER3	152 MM Btu/hr	Low NO <sub>x</sub> Boilers
EG-BOILER4	106 MM Btu/hr	Low NO <sub>x</sub> Boilers
EG-BOILER5	152 MM Btu/hr	Low NO <sub>x</sub> Boilers
EG-BOILER6	192 MM Btu/hr	None

## 3. SAMPLE LOCATION

Figures 1 through 4 below depict the sources sampled and sampling location. **Appendix B** contains detailed Schematics of all sampling locations.

**Figure 1:** EG-BOILER 3 Outlet

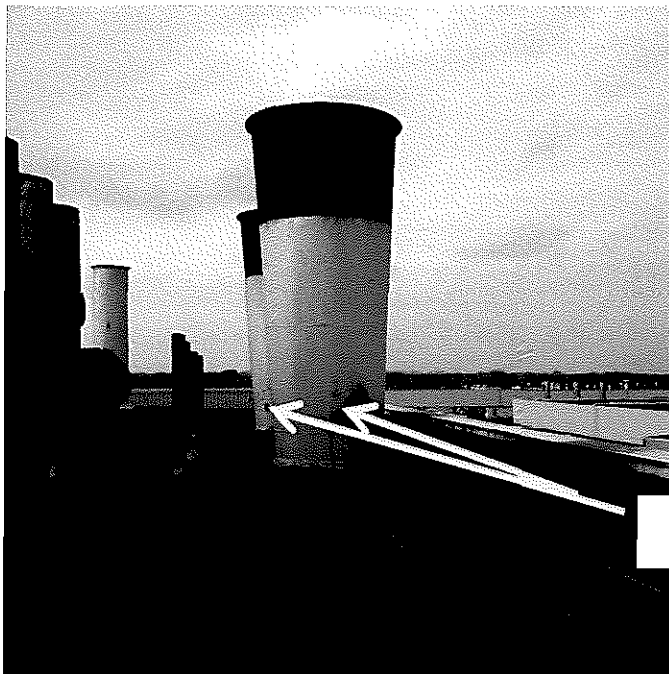


Exhaust Port Locations



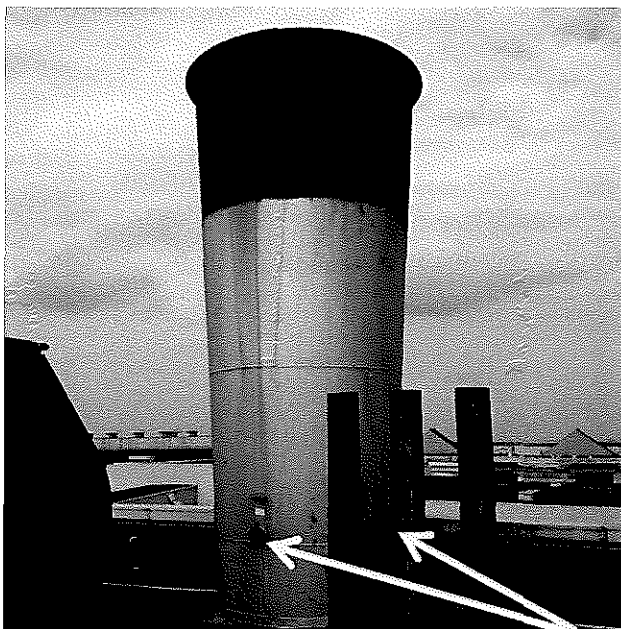
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Figure 2: EG-BOILER 4 Outlet



Exhaust Port Locations

Figure 3: EG-BOILER 5 Outlet



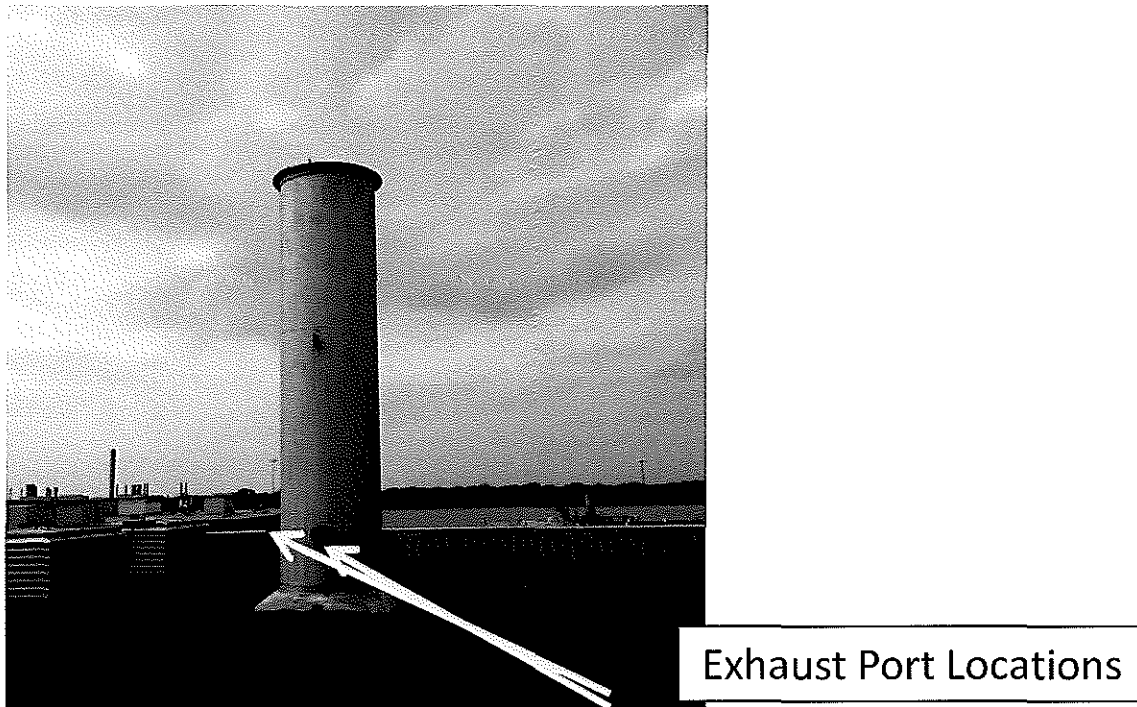
Exhaust Port Locations





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**Figure 4: EG-BOILER 6 Outlet**



## 4. SAMPLING METHODOLOGY

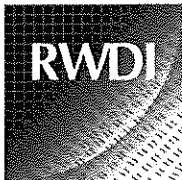
### 4.1 Testing Methodology

The following table summarizes the test methodologies that were followed during this program.

**Table 4: Summary of Test Methodology**

Parameter	Proposed Method
Emission Factors	USEPA <sup>[1]</sup> Method 19
Oxides of Nitrogen (NOx)	USEPA <sup>[1]</sup> Method 7E (CEM)
Oxygen	USEPA <sup>[1]</sup> Method 3A (CEM)

**Notes:** [1] USEPA = United States Environmental Protection Agency



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## 4.2 Description of Testing Methodology

The following section provides brief descriptions of the sampling methods.

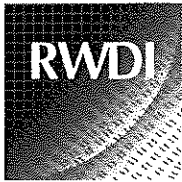
### 4.2.1 USEPA Method 3A

USEPA Method 3A, "Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrument Analyzer Procedure)", was used to measure the oxygen concentration of the flue gas. The oxygen content was measured in conjunction with the nitrogen oxide emission rate in order to calculate an emission factor as outlined in USEPA Method 19. The exhaust gas sample was withdrawn from a single point at the centre of the duct/stack using a stainless steel probe. The sample proceeded through a heated filter where particulate matter was removed. The sample was then transferred via a heated Teflon® line and introduced to the analyzers (hot/wet) for measurement. A Rosemount Model NGA2000 Non-Dispersive Infrared Analyzer (NDIR) was used for oxygen measurements. A schematic of the sampling system apparatus is located in **Appendix B**.

Prior to testing, a 3-point analyzer calibration error check was conducted using USEPA protocol gases. The calibration error check was performed by introducing zero, mid and high level calibration gases directly into the analyzer. The calibration error check was performed to confirm that the analyzer response was within  $\pm 2\%$  of the certified calibration gas introduced. Prior to each test run, a system-bias test was performed where known concentrations of calibration gases were introduced at the probe tip to measure if the analyzers response was within  $\pm 5\%$  of the introduced calibration gas concentrations. At the conclusion of each test run a system-bias check was performed to evaluate the percent drift from pre and post-test system bias checks. The system bias checks confirmed that the analyzer did not drift greater than  $\pm 3\%$  throughout a test run.

Data acquisition was provided using a data logger system programmed to collect and record data at one second intervals. Average one minute concentrations were calculated from the one second measurements.

**Appendix C, D, E and F** contains detailed data for Oxygen and NO<sub>x</sub>, including summary of results and 1 minute averages for **EG-BOILERS 3, 4, 5 and 6** respectively. Calibration error check and system bias check information is located in **Appendix G** with calibration gas Certificates of Accuracy located in **Appendix H**



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#### 4.2.2 USEPA Method 7E

NO<sub>x</sub> emissions were measured following USEPA Method 7E, "Determination of Nitrogen Oxides Emissions from Stationary Sources." The NO<sub>x</sub> concentration was measured using a Teledyne Chemiluminescence gas analyzer. The exhaust gas sample was withdrawn from a single point at the centre of the duct/stack using a stainless steel probe. The sample proceeded through a heated filter where particulate matter was removed. The sample was then transferred via a heated Teflon® line and introduced to the analyzers (hot/wet) for measurement.

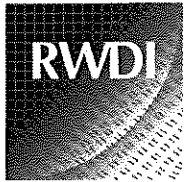
Prior to testing at each sampling location, a 3-point stratification test was conducted at 16.7, 50 and 83.3 percent of the stack diameter for at least twice the response time as outlined in the method. At all four sources the NO<sub>x</sub> concentration were measured to be uniform in the stack cross section and were less than  $\pm 5\%$  or 0.5ppm of the mean concentration for all three traverse points. The gas stream was considered to be unstratified and a single sampling point, located at the centroid of the stack was used for sampling. Stratification information is included in **Appendix G**.

A NO/NO<sub>2</sub> conversion check was performed prior to each new source by introducing NO<sub>2</sub> gas into the NO<sub>x</sub> analyzer. The analyzers NO<sub>x</sub> concentration readout was greater than 90% of the introduced calibration gas; therefore the conversion met the converter efficiency requirement of section 13.5 of USEPA Method 7E. NO/NO<sub>2</sub> conversion data is located in **Appendix G**

Calibration error and system-bias checks were performed as described in section 4.2.1.

#### 4.2.3 USEPA Method 19

USEPA Method 19, "Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide and Nitrogen Oxide Emission Rates," was used to calculate a NO<sub>x</sub> emission factor based on Oxygen concentrations and appropriate F-factors. Equation 19-1 from the method was used. **Appendix I** contains information on NO<sub>x</sub> emission factor calculations.



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## 5. PROCESS DATA

WTAP representatives provided production information during testing of the boilers including steam load (lbs/hr) and natural gas usage per test (hr) details are located in **Appendix I** for the steam load and natural gas used for each test run. Below is a table showing steam load and gas usage during testing.

**Table 5: Process Data**

Source	Parameter	Run 1	Run 2	Run 3	Average
EG-GASBOILER3	Date	27-Nov-15	27-Nov-15	27-Nov-15	
	Time	7:46 to 8:46	9:00 to 10:00	10:15 to 11:15	
	Steam (lb/hr)	77,000	77,000	77,000	77,000
	Natural Gas (scfm)	91,927	91,832	91,875	91,878
EG-GASBOILER4	Date	27-Nov-15	27-Nov-15	27-Nov-15	
	Time	12:10 to 13:10	13:20 to 14:20	14:32 to 15:31	
	Steam (lb/hr)	59,000	61,000	57,000	59,000
	Natural Gas (scfm)	70,000	71,000	66,000	69,000
EG-GASBOILER5	Date	26-Nov-15	26-Nov-15	26-Nov-15	
	Time	12:50 to 13:50	14:00 to 15:00	15:15 to 16:15	
	Steam (lb/hr)	86,000	88,000	84,000	86,000
	Natural Gas (scfm)	96,000	98,000	93,000	95,667
EG-GASBOILER6	Date	26-Nov-15	26-Nov-15	26-Nov-15	
	Time	7:30 to 8:30	8:45 to 9:45	10:00 to 11:00	
	Steam (lb/hr)	86,000	82,000	83,000	83,667
	Natural Gas (scfm)	90,000	93,000	90,000	91,000

Prior to commencing the testing, Mr. Patel and/or Mr. Duncan confirmed that the process was operating normally and the steam load was within 50-70% of full capacity.

## 6. RESULTS

The average emission results for this study are presented in the table below. Detailed information regarding each test run can be found in Appendix C, D, E and F for EG-BOILERS 3, 4, 5 and 6 respectively.

**Table 1: Nitrogen Oxide Emissions**

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lb/MM Btu: pound per million British thermal unit  
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## 7. CONCLUSIONS

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Testing was successfully completed from January 26<sup>th</sup> to January 27<sup>th</sup>, 2016. All parameters were tested in accordance with USEPA referenced methodologies. Field notes from the testing program can be found in **Appendix J** and sample calculations are presented in **Appendix K**. The permit limits the total EG-BOILER emissions to 119 tons of NOx per 12-month rolling period; therefore, the results will be used for annual emissions reporting.