QUALITY ROASTING, LLC

PARTICULATE STACK TEST REPORT

for

MEAL COOLER

And

SOYBEAN ROASTER

at

Quality Roasting, LLC
135 S. Bradleyville Road
Reese, Michigan

Test Dates: April 14, 2021 &
June 3-4, 2021

Report Date: July 13, 2021

Report Due Date: August 3, 2021

Prepared by:

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Report Certification:

Air emissions testing was performed under my observation and in conjunction with the production operations on April 14, 2021, June 3, 2021 and June 4, 2021 at Quality Roasting's Reese, Michigan facility. This report presents the testing results and operational data collected during the testing. The data presented herein are believed to be a true and accurate representation of actual field conditions observed during the compliance testing exercise.

Bruce H. Connell

Principal

Environmental Partners, Inc.

Bruce H. Connell

July 13, 2021

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1.0 INTRODUCTION AND PURPOSE OF THE TEST PROGRAM

A compliance test program was conducted at the Quality Roasting processing facility located in Reese, Michigan on April 14, 2021, June 3, 2021, and June 4, 2021. The purpose of the test program was to verify the particulate emission rates (PM, PM-10, and PM-2.5) for the Meal Cooler (tested April 14, 2021) and the Soybean Roaster (tested June 3 and 4, 2021).

The test program was conducted in accordance with the test plan dated January 14, 2021, and confirmed by the Michigan Department of Environment, Great Lakes, and Energy (EGLE) on February 16, 2021. A copy of the test plan and the EGLE confirmation is included in Appendix A.

The process evaluated is regulated by the Michigan issued Permit-to-Install No. 61-20, issued October 19, 2020. The testing was conducted to satisfy special condition number V.1 of FG-PROCESS and to confirm compliance with special condition numbers I.1 through I.6 (presented in the following table).

Table 1 – FG-PROCESS Emission Limits

Pollutant	Limit	Time Period / Operating Scenario	Equipment	Monitoring / Testing Method	Underlying Applicable Requirements
1. PM	2.16 pph	Hourly	EU-ROASTER (2 stacks combined)	SC V.1	R 336.1205, R 336.1331(1)(c)
2. PM10	0.95 pph	Hourly	EU-ROASTER (2 stacks combined)	SC V.1	R 336.1205, 40 CFR 52.21(c) and (d)
3. PM2.5	0.95 pph	Hourly	EU-ROASTER (2 stacks combined)	SC V.1	R 336.1205, 40 CFR 52.21(c) and (d)
4. PM	2.97 pph	Hourly	EU-MEALCOOLER	SC V.1	R 336.1205, R 336.1331(1)(c)
5. PM10	1.45 pph	Hourly	EU-MEALCOOLER	SC V.1	R 336.1205, 40 CFR 52.21(c) and (d)
6. PM2.5	1.45 pph	Hourly	EU-MEALCOOLER	SC V.1	R 336.1205, 40 CFR 52.21

The overall compliance test program was coordinated by Mr. Bruce Connell, of Environmental Partners, Inc. The compliance test program was performed by The Stack Test Group. Plant operations were coordinated by Mr. Jeff Laverty, Quality Roasting. The compliance test program was witnessed by Ms. Regina Angelloti, EGLE-AQD and Mr. Ben Witkopp, EGLE-AQD.

2.0 PROCESS AND CONTROLS SYSTEMS DESCRIPTION

The Quality Roasting Reese, Michigan facility processes soybeans utilizing heat and pressure to extract soybean oil and soybean meal. Both by-products are utilized in the agricultural industry as protein nutrients in animal feed. Two operations within the process (roaster and meal cooler) utilize air movement to either heat or cool the solid material. As a result, there is the potential for the emission of particulate matter. Each process is controlled by cyclones to reduce particulate emissions.

The soybean roaster (Roaster), utilizes heat to soften the soybean, which is later extruded and pressed to extract the oil. The hot combustion air passes through the beans and is exhausted through a pair of cyclones, operating in parallel. As the hot air passes through the beans smaller size particulate matter become entrained in the air stream. The cyclones are used to remove particulate before being discharged to the atmosphere. The collected particulate is then added back into the process, before the next stage of the process. For the Roaster, stack testing was conducted in each post cyclone exhaust stack simultaneously, and the hourly emission rates added together for a total hourly emission rate.

The Meal Cooler cools the soy meal (post oil extraction) in a stratified holding container with the warmer product at the top and cooler product at the bottom. Air is drawn through the cooler, in a counter flow manner, entering at the bottom of the cooler and discharging out the top. As the air passes through the meal, there is the potential for some finer pieces of particulate to become dislodged and carried out with the exhaust air. To recover the dislodged soy meal, the exhaust air passes through a single cyclone which removes particulate from the exhausting air stream prior to discharging to atmosphere.

In accordance with Special Condition IV.3 of FG-PROCESS, the process is limited by the capacity of the three screw presses, which is 100 tons of soybean meal per 24 hours per press (300 tons per day for the process). Appendix B contains a copy of the data demonstrating the process limitation and the association with the Roaster inlet airlock frequency. Based on this data, the frequency of the inlet airlock was monitored as a method of determining maximum throughput of the process. Appendix B also contains data entry of the Roaster inlet airlock frequency during each test run for both the Roaster and Meal Cooler.

of the three emission rates. For the Roaster, the particulate loading rates have been added together for comparison against the permit limits.

3.1 Volumetric Flow Rate Determination – USEPA Methods 1 - 4

The volumetric flow rate within each exhaust stack was determined following USEPA Methods 1 through 4. Velocity measurement points were selected in accordance with USEPA Method 1. Gas stream velocities were determined using a Type-S pitot tube and inclined manometer in accordance with USEPA Method 2.

Two velocity measurements were made at each test location for each one hour test run, one just before and one just after each test. The completion of the first and second test runs were reasonably temporally coincidental to the start of the subsequent test runs, therefore the ending velocity measurement for the previous test run was utilized as the beginning velocity measurement for the subsequent test run.

Concentrations of carbon dioxide were determined using the instrumental analyzer technique in accordance with USEPA Method 3A. Gas stream moisture contents were determined by passing the exhaust sample gas through a series of four chilled impingers containing pre-measured amounts of absorbing solution, followed by an impinger containing silica gel. Volumetric determinations were made of moisture gain, and equivalent water vapor volumes were determined in accordance with USEPA Method 4.

3.2 Particulate Emissions Determination – USEPA Methods 5 / 202

The procedures outlined in USEPA Method 5 and USEPA 202 were followed to determine both the filterable and condensable particulate emissions in the post-controlled exhaust streams of each process (EU-MEALCOOLER and EU-ROASTER).

For the meal cooler, each of three test runs consisted of velocity and particulate measurements taken from 12 points, 6 points across each of the two test ports, set in the same horizontal plane at 90° apart with respect to each other.

For the roaster, each of four test runs consisted of velocity and particulate measurements taken from 24 points, 12 points across each to the two test ports, set in the same horizontal plane at 90° apart with respect to each other.

A summary of testing maybe found in section 5.0.

4.0 PRESENTATION OF PRODUCTION DATA

The EGLE-AQD stack test approval letter, dated February 16, 2021, requested that the process be operated at greater than 90% of maximum production rate. The process throughput is set by the Roaster inlet airlock, which dictates soybean delivery to the front end of the Roaster. It has been confirmed that the set point of 47 – 49 Hz for the inlet airlock correlates to a soybean throughput rate, at the screw presses, of approximately 300 tons per 24 hours (12.5 tons per hour). A copy of this correlation data is provided in Appendix B.

During each test run, roaster inlet airlock frequency was recorded at five (5) minute intervals. This data is located in Appendix B. Table 2 presents an average frequency for each test run.

Table 2 – Roaster Inlet Frequency Rates

Process	**Test 1**	**Test 2**	**Test 3**	**Test 4**
Meal Cooler Test	47.313 Hz	47.301 Hz	47.579 Hz	NA
	293.5 tpd	293.5 tpd	295.7 tpd	
Roaster Tests	47.315 Hz	47.311 Hz	47.295 Hz	47.314 Hz
	293.5 tpd	293.5 tpd	293.5 tpd	293.5 tpd

The meal cake testing, demonstrated that when operating 2 presses, the average Roaster inlet frequency was 35.4 Hz and the calculated daily soybean loading rate 200.2 tons per 24 hour-day. When the same feed rate trial was performed under a 3 press operation, the Roaster inlet frequency was 48.2 Hz and the calculated daily soybean loading rate 300.6 tons per 24 hour-day. Based on this information, and the data provided in Table 2, it is believed that on the days of testing, the roaster soybean delivery rate was equivalent to 293.5 tons per 24 hour-day (12.2 tons per hour) or approximately 97.6% of the maximum production rate.

Table 4
Soybean Roaster –Stack Test Summary
Quality Roasting
Reese, Michigan
Test Date: June 3 and 4, 2021

Parameter	**1**	**2**	**3**	**4**	**Avg**
Date	6/3/21	6/3/21	6/3/21	6/4/21	
Start Time	08:30	11:00	13:20	09:00	
Stop Time	09:36	12:03	14:55	10:05	
East Stack Test Data					
Volumetric Flow Rate (acfm)	13,342	12,978	12,945	13,002	13,067
Moisture Content (%)	8.38%	9.20%	8.79%	8.20%	8.64%
Stack Temperature (°F)	231.71	221.96	217.79	214.42	221.47
Volumetric Flow Rate (dscfm)	9,110	8,907	8.980	9,132	9,032
East Stack Particulate Emissions Rate					
Total PM (lbs/hr)[1]	1.376	8.449	1.663	4.155	3.911
Organics (lbs/hr)	0.218	0.106	0.251	0.150	0.181
Aqueous (lbs/hr)	0.049	0.056	0.067	0.060	0.058
Total PM-10/PM-2.5 (lbs/hr)[2]	0.267	0.162	0.318	0.210	0.239
West Stack Test Data					
Volumetric Flow Rate (acfm)	13,172	13,224	13,238	13,054	13,172
Moisture Content (%)	7.43%	8.13%	8.40%	7.55%	7.88%
Stack Temperature (°F)	200.96	193.83	191.92	187.83	193.64
Volumetric Flow Rate (dscfm)	9,510	9,578	9,588	9,613	9,572
West Stack Particulate Emissions Rate					
Total PM (lbs/hr)[1]	2.499	2.131	2.145	1.194	1.992
Organics (lbs/hr)	0.213	0.260	0.117	0.184	0.193
Aqueous (lbs/hr)	0.226	0.236	0.180	0.100	0.186
Total PM-10/PM-2.5 (lbs/hr)[2]	0.439	0.496	0.297	0.284	0.379
Combined Particulate Emissions Rate					
Total PM (lbs/hr) - East	1.376	8.449	1.663	4.155	3.911
Total PM (lbs/hr) - West	2.499	2.131	2.145	1.194	1.992
Total PM (lbs/hr)[1]	**3.875**	**10.580**	**3.808**	**5.349**	**5.903**
PM-10/PM-2.5 (lbs/hr) – East[2]	0.267	0.162	0.318	0.210	0.239
PM-10/PM-2.5 (lbs/hr) – West[2]	0.439	0.496	0.297	0.284	0.379
Total PM-10/PM-2.5 (lbs/hr)	**0.706**	**0.658**	**0.615**	**0.494**	**0.618**

[1] Total PM includes both filterable and condensable emission rates.
[2]PM-10 / PM-2.5 includes the sum of both organic and aqueous emission rates.