BTEC Inc.

EUPRETZEL Particulate Matter Test Summary Report

Prepared for:

Cargill Salt Inc.

916 S Riverside Avenue
St Clair, MI 48079

Project No. 17 - 5079.00
July 24, 2017

BT Environmental Consulting, Inc.
4949 Fernlee Ave
Royal Oak, Michigan 48073
(248) 548-8070

Executive Summary

BT Environmental Consulting, Inc. (BTEC) was retained by Cargill Salt to conduct an engineering emissions test program on one source associated with the EU-PRETZEL line at the Cargill Salt facility in St. Clair, Michigan. This emissions testing program included evaluation of particulate matter (PM) from the EU-PRETZEL line. Sampling was conducted on July 7th, 2017.

Testing consisted of triplicate 60-minute test runs for PM. Sampling was performed utilizing United States Environmental Protection Agency (USEPA) test methods. The results of the emissions test program are highlighted by Table E-I.

Table E-I
Overall Results Summary
Sampling Dates: July 7, 2017

Source	Pollutant	Average Test Result	Emission Limit
EU-PRETZEL LINE	PM	0.58 lb/hr	5.2 lb/hr
EU-PRETZEL LINE	PM	0.012 g/dscm	0.05 g/dscm

1. Introduction

BT Environmental Consulting, Inc. (BTEC) was retained by Cargill Salt to conduct an engineering emissions test program on one source associated with the EU-PRETZEL line at the Cargill Salt facility in St. Clair, Michigan. This emissions testing program included evaluation of particulate matter (PM) from the EU-PRETZEL line. Sampling was conducted on July 7th, 2017.

The Air Quality Division (AQD) of Michigan's Department of Environmental Quality has published a guidance document entitled "Format for Submittal of Source Emission Test Plans and Reports" (December 2013). The following is a summary of the emissions test program and results in the format suggested by the aforementioned document.

1.a Identification, Location, and Dates of Test

The source tested is located at the Cargill Salt facility located in St. Clair, Michigan. Testing on the EU-PRETZEL line was conducted July 7, 2017.

1.b Purpose of Testing

The purpose of the testing is for internal engineering purposes.

Table 1

Source	Pollutant	Emission Limit
EU-PRETZEL LINE	PM	5.2 lb/hr
EU-PRETZEL LINE	PM	0.05 g/dscm

1.c Source Description

A series of equipment used to process salt. Equipment includes grinders, screens, storage bins, feeders, conveyors, etc. All equipment is operated indoors within its own enclosure and/ or is ducted to the auxiliary third floor wet scrubber.

1.d Test Program Contact

The contacts for information regarding the test program as well as the test report are:

Mrs. Priscila Gavel
EHS Professional
Cargill Salt
916 S. Riverside Ave
St. Clair, Michigan 48079

Mr. Barry P. Boulianne
Senior Project Manager
BT Environmental Consulting, Inc.
4949 Fernlee Avenue
Royal Oak, Michigan 48073
(313) 449-2361

1.e Test Personnel

Names and affiliations for personnel who were present during the testing program are summarized by Table 1.

Table 2
Test Personnel

Name	Affiliation
Priscila Gavel	Cargill Salt
Paul Diven	BTEC
Mike Nummer	BTEC
Mark Dziados	MDEQ

2. Summary of Results

Sections 2.a through 2.d summarize the results of the emissions test program.

2.a Operating Data

The water flow rate and the differential pressure are checked daily.

2.b Applicable Permit

MDEQ PTI No. A6240-167-14A-2017.

2.c Results

The results of the emissions test program are summarized by Table 3. Detailed results for the test runs are summarized in Table 4.

2.d Emission Regulation Comparison

The PM emission rate of 0.58 lb/hr and 0.012 g/dscm is less than the permitted limit of 5.2 lb/hr and 0.05 g/dscm.

3. Source Description

Sections 3.a through 3.e provide a detailed description of the process.

3.a Process Description

Section 1.c provides a detailed description of the process.

3.b Process Flow Diagram

Due to the simplicity of the EU-PRETZEL operations, a process flow diagram is not necessary.

3.c Raw and Finished Materials

The raw materials include natural gas and salt.

3.d Process Capacity

Proper operation of the wet scrubber for EUPRETZEL is defined as a pressure drop range between 4.2 and 7.2 inches of water column and scrubbing liquid flow rate of at least 36 gallons per minute.

3.e Process Instrumentation

The water flow rate and the differential pressure are checked daily.

4. Sampling and Analytical Procedures

Sections 4.a through 4.d provide a summary of the sampling and analytical procedures used during the testing.

4.a Sampling Train and Field Procedures

Sampling and analytical methodologies for the emissions test program can be separated into two categories as follows:

(1) Measurement of exhaust gas velocity, molecular weight, and moisture content;
(2) Measurement of exhaust gas filterable PM concentration;

Sampling and analytical methodologies by category are summarized below.

Exhaust Gas Velocity, Molecular Weight, and Moisture Content

Measurement of exhaust gas velocity, molecular weight, and moisture content was conducted using the following reference test methods codified at Title 40, Part 60, Appendix A of the Code of Federal Regulations (40 CFR 60, Appendix A):

- Method 1 - *"Location of the Sampling Site and Sampling Points"*
- Method 2 - *"Determination of Stack Gas Velocity and Volumetric Flowrate"*

- Method 3 - *"Determination of Molecular Weight of Dry Stack Gas"(Fyrite)*
- Method 4 - *"Determination of Moisture Content in Stack Gases"*

Stack gas velocity traverses were conducted in accordance with the procedures outlined in Method 1 and Method 2. S-type pitot tubes with thermocouple assemblies, calibrated in accordance with Method 2, Section 4.1.1, were used to measure exhaust gas velocity pressures (using a manometer) and temperatures during testing. The S-type pitot tube dimensions outlined in Method 2, Figures 2-6 through 2-8 were within specified limits, therefore, a baseline pitot tube coefficient of 0.84 (dimensionless) was assigned. A diagram of the sample points is provided in Figure 1.

Cyclonic flow checks were performed at each sampling location. The existence of cyclonic flow is determined by measuring the flow angle at each sample point. The flow angle is the angle between the direction of flow and the axis of the stack. If the average of the absolute values of the flow angles is greater than 20 degrees, cyclonic flow exists.

The Molecular Weight of the gas stream was evaluated according to procedures outlined in Title 40, Part 60, Appendix A, Method 3. The O_2 /CO_2 content of the gas stream was measured using a Fyrite combustion analyzer.

Exhaust gas was extracted as part of the sampling train. Exhaust gas moisture content was then determined gravimetrically.

Filterable Particulate Matter – Method 5

40 CFR 60, Appendix A, Method 5, "Determination of Particulate Emissions from Stationary Sources" was used to measure PM concentrations and calculate appropriate emission rates (see Figure 2 for a schematic of the sampling train).

BTEC's Nutech® Model 2010 modular isokinetic stack sampling system consisted of (1) a stainless steel nozzle, (2) a glass probe, (3) a set of four Greenburg-Smith (GS) impingers with the first two with 100 ml of H2O (ii) an empty impinger, (iii) and an impinger filled with approximately 300 grams of silica gel, (4) a length of sample line, and (5) a Nutech® control case equipped with a pump, dry gas meter, and calibrated orifice.

Upon completion of the final leak test for each test run, the filter was recovered, and the nozzle, probe, and the front half of the filter holder assembly were brushed and triple rinsed with water which was collected in a pre-cleaned sample container.

BTEC labeled each container with the test number, test location, and test date, and marked the level of liquid on the outside of the container. In addition, blank samples of the acetone and filter were collected. BTEC personnel carried all samples to BTEC's laboratory (for filter and water gravimetric analysis) in Royal Oak, Michigan.

4.b Recovery and Analytical Procedures

Descriptions of the recovery procedures are provided in section 4.a for each sampling method.

4.c Sampling Ports

A diagram of the stack showing sampling ports are included as Figure 1.

4.d Traverse Points

A diagram of the stack showing sampling ports are included as Figure 1.

5. Test Results and Discussion

Sections 5.a through 5.k provide a summary of the test results.

5.a Results Tabulation

The overall results of the emissions test program are summarized by Table 3. Emission limits are summarized by Table 1. Detailed results for the emissions test program are summarized by Table 4.

5.b Discussion of Results

The average results of the particulate matter emissions of the EUPRETZEL are below the corresponding emission limits.

Table 3
Overall Results Summary
Sampling Dates: June 12, 2017

Source	Pollutant	Average Test Result	Emission Limit
EU-PRETZEL LINE	PM	0.58 lb/hr	5.2 lb/hr
EU-PRETZEL LINE	PM	0.012 g/dscm	0.05 g/dscm

During Run 2, the sampling train was bumped causing the Teflon line between the heated filter holder and impingers to adjust potentially introducing a leak into the sampling train. The Teflon line was adjusted, and the post test leak check was within passing requirements, but the integrity of the sample data was potentially compromised. After discussion with Mark Dziados of the MDEQ, BTEC decided to void Run 2 and perform an additional sample run. Field sheets and laboratory results from Run 2 are presented in

Appendix A and Appendix D, respectively, but Run 2 has been excluded from the results in Tables 3 and 4. The results presented in Tables 3 and 4 are the average emissions from Run 1, Run 3, and Run 4.

It should also be noted that the sampling location was moved since the previous compliance test, to the roof where new sampling ports were installed on the stack. This was due to the previous location causing entrained water droplets to be drawn into the sampling train as well as having cyclonic flow rate. The new sampling location addressed both of these issues.

5.c Sampling Procedure Variations

Due to the high salt content of the sample BTEC performed probe rinses with water instead of acetone. A blank water analysis was conducted to ensure there was no bias with the water rinse.

5.d Process or Control Device Upsets

No process or control device upsets occurred during the emissions test program.

5.e Control Device Maintenance

There was no control equipment maintenance performed prior to the emissions test program.

5.f Retest

This emissions test program was a retest.

5.g Audit Sample Analyses

Audit samples were not analyzed as part of this emissions test program.

5.h Calibration Sheets

Calibration documents are provided as Appendix B.

5.i Sample Calculations

Sample calculations are provided as Appendix C.

5.j Field Data Sheets

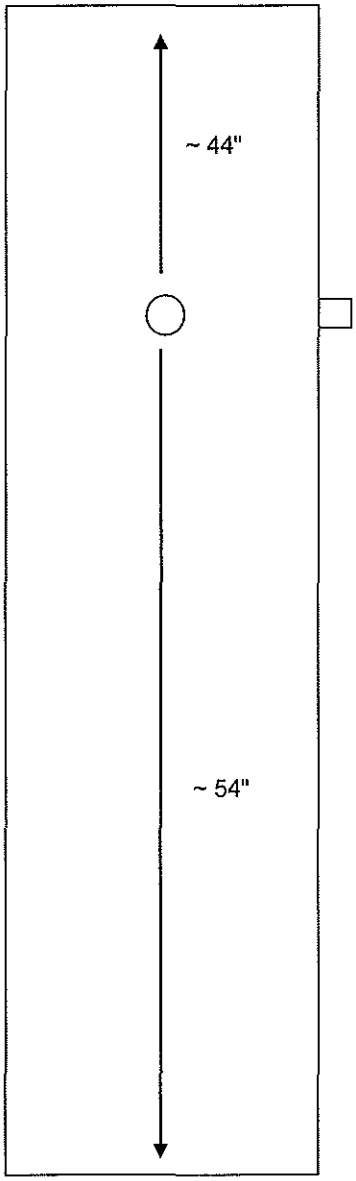
Field data sheets are provided in Appendix A.

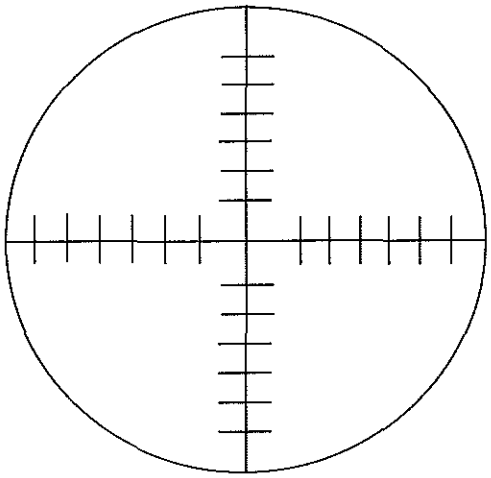
Table 4
EUPRETZEL Particulate Matter Emission Rates

Company	**Cargill Salt**			
Source Designation	**Pretzel Line Roof**			
Test Date	**7/7/2017**	**7/7/2017**	**7/7/2017**	
Meter/Nozzle Information	P-1	P-3	P-4	Average
Meter Temperature Tm (F)	86.4	97.8	97.4	92.1
Meter Pressure - Pm (in. Hg)	29.3	29.3	29.3	29.3
Measured Sample Volume (Vm)	49.0	51.1	52.3	50.1
Sample Volume (Vm-Std ft3)	46.4	47.4	48.5	46.9
Sample Volume (Vm-Std m3)	1.31	1.34	1.37	1.33
Condensate Volume (Vw-std)	1.839	1.980	2.075	1.910
Gas Density (Ps(std) lbs/ft3) (wet)	0.0735	0.0734	0.0734	0.0734
Gas Density (Ps(std) lbs/ft3) (dry)	0.0745	0.0745	0.0745	0.0745
Total weight of sampled gas (m g lbs) (wet)	3.54	3.62	3.71	3.58
Total weight of sampled gas (m g lbs) (dry)	3.46	3.53	3.61	3.49
Nozzle Size - An (sq. ft.)	0.000404	0.000404	0.000404	0.000404
Isokinetic Variation - I	100.6	100.9	100.9	100.8
Stack Data				
Average Stack Temperature - Ts (F)	87.4	87.6	87.1	87.5
Molecular Weight Stack Gas- dry (Md)	28.8	28.8	28.8	28.8
Molecular Weight Stack Gas-wet (Ms)	28.4	28.4	28.4	28.4
Stack Gas Specific Gravity (Gs)	0.981	0.981	0.980	0.981
Percent Moisture (Bws)	3.81	4.01	4.10	3.91
Water Vapor Volume (fraction)	0.0381	0.0401	0.0410	0.0391
Pressure - Ps ("Hg)	29.2	29.1	29.1	29.1
Average Stack Velocity -Vs (ft/sec)	35.1	35.9	36.8	35.5
Area of Stack (ft2)	7.0	7.0	7.0	7.0
Exhaust Gas Flowrate				
Flowrate ft^3(Actual)	14,674	15,000	15,367	14,837
Flowrate ft^3 (Standard Wet)	13,797	14,078	14,427	13,938
Flowrate ft^3 (Standard Dry)	13,271	13,514	13,835	13,392
Flowrate m^3 (standard dry)	376	383	392	379
Total Particulate Weights (mg)				
Nozzle/Probe/Filter	18.4	12.3	14.5	15.4
Total Particulate Concentration				
lb/1000 lb (wet)	0.011	0.007	0.009	0.009
lb/1000 lb (dry)	0.012	0.008	0.009	0.010
mg/dscm (dry)	14.0	9.2	10.6	11.6
gr/dscf	0.0061	0.0040	0.0046	0.0051
Total Particulate Emission Rate				
lb/ hr	0.70	0.47	0.55	0.58

BTEC Inc.

diameter = 35.75 inches





Not to Scale

Points	Distance "
1	0.8
2	2.4
3	4.2
4	6.3
5	8.9
6	12.7
7	23.0
8	26.8
9	29.4
10	31.5
11	33.4
12	35.0

Figure 1

Site: **Eupretzel** **Cargill Salt** **St. Clair, MI**	**Sampling Dates:** **July 7, 2017**	**BT Environmental Consulting, Inc.** **4949 Fernlee** **Royal Oak, Michigan**

BTEC Inc.

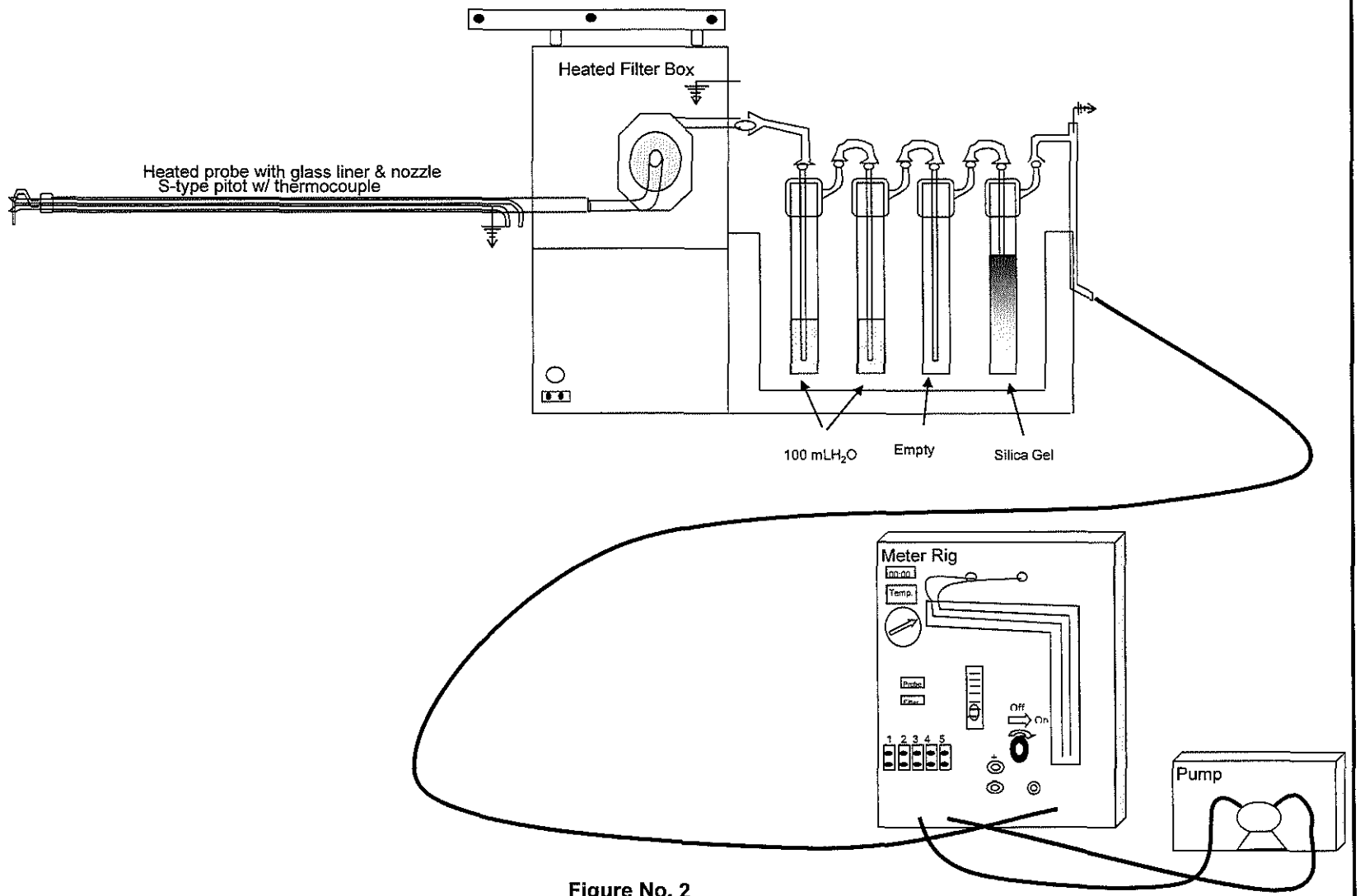


Figure No. 2

Site: **USEPA Method 5** **Cargill Salt** **St.Clair, Michigan**	**Sampling Date:** **July 7, 2017**	**BT Environmental Consulting, Inc.** **4949 Fernlee Avenue** **Royal Oak, Michigan 48073**