



**Polyvinyl Butyral
Manufacturing (Polykettle)
Alcohol Solution Production
Emissions Test Report**

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AIR QUALITY DIVISION

Prepared for:

Solutia Inc.

Trenton Plant
5100 West Jefferson Avenue
Trenton, Michigan 48183

Project No. 049AS-270975
June 20, 2018

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

EXECUTIVE SUMMARY

Solutia Inc. (Solutia) retained BT Environmental Consulting, Inc. (BTEC) to evaluate emission rates of acetaldehyde (AcH), vinyl acetate (VAc), ethanol (EtOH), and ethyl acetate (EtAc) from three polyvinyl butyral production (“polykettle”) processes (EUPOLYKETTLE1, EUPOLYKETTLE2, and EUPOLYKETTLE3) during production of “Product 2” (i.e., Alcohol Solution Production). The purpose of the emissions test program was to evaluate exhaust gas flowrates and AcH, VAc, EtOH, and EtAc concentrations and emission rates at three separate sampling locations on each of three polykettle reactor trains. Emission rates were found to be less than emission rates used for the previous design evaluation. Therefore the emission rates from this testing program will not be used for another design evaluation. The emission rates will be used by Solutia to demonstrate compliance with the requirements of Michigan Department of Environmental Quality Air Quality Division (AQD) Permit No. 12-13A as well as the National Emission Standards for Hazardous Air Pollutants for Chemical Manufacturing Area Sources codified at Title 40, Part 63, Subpart VVVVVV of the Code of Federal Regulations (40 CFR 63, Subpart VVVVVV).

The emissions test program was conducted consistent with the emissions test plan and corresponding alternative test methods approval request letter dated November 17, 2017 (see Appendix H). The emissions test plan and corresponding alternative test methods approval request letter were approved by U.S. EPA and AQD in letters dated and January 9, 2018 and January 10, 2018, respectively (also in Appendix H). No variations from the approved emissions test protocol occurred during the testing with the following exceptions:

- (1) Due to a malfunction of the Method 320 sampling system at the condenser outlet sampling location on the EUPOLYKETTLE2 system, emission measurements only included those at the condenser inlet and scrubber outlet sampling locations.
- (2) Exhaust velocity pressure data for Test Run 1 on EUPOLYKETTLE1 was corrupted and could not be retrieved. Consequently, this test run was not used and an additional test run (Test Run 4) was conducted on EUPOLYKETTLE1.

Portions of the emissions test program were witnessed by Mr. Mark Dziadosz of AQD.

The alcohol solution production emissions test program was conducted on April 30 and May 1, 2, 3, and 4, 2018. Testing consisted of triplicate test runs at the condenser inlet, condenser outlet, and scrubber outlet sampling locations on each of three polykettle reactor train (with the exceptions listed above). Each test run was for the duration of the polykettle batch cycle. The results of the emission test program are summarized in lb/hr by Tables E-I, E-II, and E-III and in lb/batch by Tables E-IV, E-V, and E-VI.

Table E-1
Polykettle #1 Acetaldehyde, Vinyl Acetate, Ethanol, and Ethyl Acetate Emissions Test Results Summary
Alcohol Solution Production
Solutia Inc.
Trenton, Michigan

Test Run No.	Test Starting Date	Test Run Start Time	Test Run End Time	Condenser Inlet Acetaldehyde Emission Rate (lbs/hr)	Condenser Inlet Vinyl Acetate Emission Rate (lbs/hr)	Condenser Inlet Ethanol Emission Rate (lbs/hr)	Condenser Inlet Ethyl Acetate Emission Rate (lbs/hr)	Condenser Outlet Acetaldehyde Emission Rate (lbs/hr)	Condenser Outlet Vinyl Acetate Emission Rate (lbs/hr)	Condenser Outlet Ethanol Emission Rate (lbs/hr)	Condenser Outlet Ethyl Acetate Emission Rate (lbs/hr)	Scrubber Outlet Acetaldehyde Emission Rate (lbs/hr)	Scrubber Outlet Vinyl Acetate Emission Rate (lbs/hr)	Scrubber Outlet Ethanol Emission Rate (lbs/hr)	Scrubber Outlet Ethyl Acetate Emission Rate (lbs/hr)	Overall HAP Control Efficiency (%)
2	4/30/2018	19:04	4:06	0.01	1.69	0.24	0.01	0.001	0.15	0.01	0.001	0.000000	0.000170	0.000008	0.000008	99.99
3	5/1/2018	4:47	13:48	0.01	1.84	0.28	0.01	0.001	0.15	0.01	0.001	0.000001	0.000189	0.000008	0.000008	99.99
4	5/1/2018	14:31	23:01	0.01	2.99	0.50	0.01	0.001	0.11	0.01	0.002	0.000000	0.001152	0.000017	0.000039	99.96
Averages:				0.01	2.17	0.34	0.01	0.001	0.14	0.01	0.001	0.000000	0.000504	0.000011	0.000018	99.98



Table E-II
Polykettle #2 Acetaldehyde, Vinyl Acetate, Ethanol, and Ethyl Acetate Emissions Test Results Summary
Alcohol Solution Production
Solutia Inc.
Trenton, Michigan



Test Run No.	Test Starting Date	Test Run Start Time	Test Run End Time	Condenser Inlet Acetaldehyde Emission Rate (lbs/hr)	Condenser Inlet Vinyl Acetate Emission Rate (lbs/hr)	Condenser Inlet Ethanol Emission Rate (lbs/hr)	Condenser Inlet Ethyl Acetate Emission Rate (lbs/hr)	Scrubber Outlet Acetaldehyde Emission Rate (lbs/hr)	Scrubber Outlet Vinyl Acetate Emission Rate (lbs/hr)	Scrubber Outlet Ethanol Emission Rate (lbs/hr)	Scrubber Outlet Ethyl Acetate Emission Rate (lbs/hr)	Overall HAP Control Efficiency (%)
1	5/2/2018	4:30	13:11	0.00	1.48	0.23	0.01	0.000001	0.002361	0.000000	0.000111	99.84
2	5/2/2018	13:54	22:44	0.01	2.23	0.39	0.01	0.000001	0.002561	0.000003	0.000097	99.89
3	5/2/2018	23:35	8:28	0.00	1.19	0.17	0.01	0.000001	0.002921	0.000001	0.000113	99.75
Averages:				0.00	1.63	0.26	0.01	0.000001	0.002614	0.000001	0.000107	99.83

Table E-III
Polykettle #3 Acetaldehyde, Vinyl Acetate, Ethanol, and Ethyl Acetate Emissions Test Results Summary
Alcohol Solution Production
Solutia Inc.
Trenton, Michigan

Test Run No.	Test Starting Date	Test Run Start Time	Test Run End Time	Condenser Inlet Acetaldehyde Emission Rate (lbs/hr)	Condenser Inlet Vinyl Acetate Emission Rate (lbs/hr)	Condenser Inlet Ethanol Emission Rate (lbs/hr)	Condenser Inlet Ethyl Acetate Emission Rate (lbs/hr)	Condenser Outlet Acetaldehyde Emission Rate (lbs/hr)	Condenser Outlet Vinyl Acetate Emission Rate (lbs/hr)	Condenser Outlet Ethanol Emission Rate (lbs/hr)	Condenser Outlet Ethyl Acetate Emission Rate (lbs/hr)	Scrubber Outlet Acetaldehyde Emission Rate (lbs/hr)	Scrubber Outlet Vinyl Acetate Emission Rate (lbs/hr)	Scrubber Outlet Ethanol Emission Rate (lbs/hr)	Scrubber Outlet Ethyl Acetate Emission Rate (lbs/hr)	Overall HAP Control Efficiency (%)
1	5/3/2018	13:16	22:28	0.002	0.38	0.06	0.001	0.001	0.11	0.01	0.001	0.000000	0.004385	0.000004	0.000125	98.86
2	5/3/2018	23:10	8:30	0.001	0.18	0.03	0.001	0.001	0.19	0.02	0.001	0.000001	0.004031	0.000002	0.000113	97.76
3	5/4/2018	9:19	18:22	0.002	0.32	0.05	0.001	0.002	0.21	0.02	0.002	0.000000	0.004360	0.000003	0.000000	98.63
Averages:				0.002	0.29	0.05	0.001	0.002	0.17	0.02	0.001	0.000000	0.004259	0.000003	0.000079	98.41



Table E-IV
Polykettle #1 Acetaldehyde and Vinyl Acetate Emissions Test Results Summary
Alcohol Solution Production
Solutia Inc.
Trenton, Michigan

Test Run No.	Test Starting Date	Test Run Start Time	Test Run End Time	Condenser Inlet Acetaldehyde Emission Rate (lbs/batch)	Condenser Inlet Vinyl Acetate Emission Rate (lbs/batch)	Condenser Inlet Ethanol Emission Rate (lbs/batch)	Condenser Inlet Ethyl Acetate Emission Rate (lbs/batch)	Condenser Outlet Acetaldehyde Emission Rate (lbs/batch)	Condenser Outlet Vinyl Acetate Emission Rate (lbs/batch)	Condenser Outlet Ethanol Emission Rate (lbs/batch)	Condenser Outlet Ethyl Acetate Emission Rate (lbs/batch)	Scrubber Outlet Acetaldehyde Emission Rate (lbs/batch)	Scrubber Outlet Vinyl Acetate Emission Rate (lbs/batch)	Scrubber Outlet Ethanol Emission Rate (lbs/batch)	Scrubber Outlet Ethyl Acetate Emission Rate (lbs/batch)
2	4/30/2018	19:04	4:06	0.06	15.27	2.18	0.06	0.007	1.35	0.10	0.012	0.000004	0.001535	0.000069	0.000070
3	5/1/2018	4:47	13:48	0.08	16.59	2.51	0.07	0.008	1.36	0.10	0.011	0.000005	0.001706	0.000070	0.000070
4	5/1/2018	14:31	23:01	0.11	25.50	4.24	0.13	0.007	0.97	0.10	0.015	0.000002	0.009813	0.000143	0.000333
Averages:				0.08	19.12	2.98	0.08	0.007	1.23	0.10	0.012	0.000004	0.004351	0.000094	0.000158



Table E-V
Polykettle #2 Acetaldehyde, Vinyl Acetate, Ethanol, and Ethyl Acetate Emissions Test Results Summary
Alcohol Solution Production
Solutia Inc.
Trenton, Michigan

Test Run No.	Test Starting Date	Test Run Start Time	Test Run End Time	Condenser Inlet Acetaldehyde Emission Rate (lbs/batch)	Condenser Inlet Vinyl Acetate Emission Rate (lbs/batch)	Condenser Inlet Ethanol Emission Rate (lbs/batch)	Condenser Inlet Ethyl Acetate Emission Rate (lbs/batch)	Scrubber Outlet Acetaldehyde Emission Rate (lbs/batch)	Scrubber Outlet Vinyl Acetate Emission Rate (lbs/batch)	Scrubber Outlet Ethanol Emission Rate (lbs/batch)	Scrubber Outlet Ethyl Acetate Emission Rate (lbs/batch)
1	5/2/2018	4:30	13:11	0.03	12.88	1.97	0.08	0.000011	0.020538	0.000004	0.000966
2	5/2/2018	13:54	22:44	0.05	19.74	3.47	0.10	0.000010	0.022666	0.000025	0.000860
3	5/2/2018	23:35	8:28	0.03	10.55	1.53	0.06	0.000011	0.025998	0.000005	0.001004
Averages:				0.04	14.39	2.32	0.08	0.000011	0.023067	0.000012	0.000943



Table E-VI
Polykettle #3 Acetaldehyde, Vinyl Acetate, Ethanol, and Ethyl Acetate Emissions Test Results Summary
Alcohol Solution Production
Solutia Inc.
Trenton, Michigan

Test Run No.	Test Starting Date	Test Run Start Time	Test Run End Time	Condenser Inlet Acetaldehyde Emission Rate (lbs/batch)	Condenser Inlet Vinyl Acetate Emission Rate (lbs/batch)	Condenser Inlet Ethanol Emission Rate (lbs/batch)	Condenser Inlet Ethyl Acetate Emission Rate (lbs/batch)	Condenser Outlet Acetaldehyde Emission Rate (lbs/batch)	Condenser Outlet Vinyl Acetate Emission Rate (lbs/batch)	Condenser Outlet Ethanol Emission Rate (lbs/batch)	Condenser Outlet Ethyl Acetate Emission Rate (lbs/batch)	Scrubber Outlet Acetaldehyde Emission Rate (lbs/batch)	Scrubber Outlet Vinyl Acetate Emission Rate (lbs/batch)	Scrubber Outlet Ethanol Emission Rate (lbs/batch)	Scrubber Outlet Ethyl Acetate Emission Rate (lbs/batch)
1	5/3/2018	13:16	22:28	0.016	3.52	0.55	0.012	0.012	1.03	0.10	0.006	0.000004	0.040	0.000035	0.001149
2	5/3/2018	23:10	8:30	0.012	1.67	0.28	0.009	0.013	1.80	0.19	0.009	0.000005	0.038	0.000015	0.001055
3	5/4/2018	9:19	18:22	0.014	2.87	0.46	0.010	0.016	1.86	0.20	0.015	0.000002	0.040	0.000030	0.000002
Averages:				0.014	2.69	0.43	0.010	0.014	1.57	0.16	0.010	0.000004	0.039	0.000027	0.000735



1. Introduction

Solutia Inc. (Solutia) retained BT Environmental Consulting, Inc. (BTEC) to evaluate emission rates of acetaldehyde (AcH), vinyl acetate (VAc), ethanol (EtOH), and ethyl acetate (EtAc) from three polyvinyl butyral production (“polykettle”) processes (EUPOLYKETTLE1, EUPOLYKETTLE2, and EUPOLYKETTLE3) during production of “Product 2” (i.e., Alcohol Solution Production). The purpose of the emissions test program was to evaluate exhaust gas flowrates and AcH, VAc, EtOH, and EtAc concentrations and emission rates at three separate sampling locations on each of three polykettle reactor trains. Emission rates were found to be less than emission rates used for the previous design evaluation. Therefore the emission rates from this testing program will not be used for another design evaluation. The emission rates will be used by Solutia to demonstrate compliance with the requirements of Michigan Department of Environmental Quality Air Quality Division (AQD) Permit No. 12-13A as well as the National Emission Standards for Hazardous Air Pollutants for Chemical Manufacturing Area Sources codified at Title 40, Part 63, Subpart VVVVVV of the Code of Federal Regulations (40 CFR 63, Subpart VVVVVV).

The alcohol solution production emissions test program was conducted on April 30 and May 1, 2, 3, and 4, 2018. The purpose of this report is to document the results of the test program. AQD has published a guidance document entitled “Format for Submittal of Source Emission Test Plans and Reports” (December 2013). This document is provided as Appendix A. 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

Sampling and analysis for the emission test program was conducted on April 30 and May 1, 2, 3, and 4, 2018, at the Solutia facility located in Trenton, Michigan.

1.b Purpose of Testing

The purpose of the emissions test program was to verify compliance with the requirements of AQD Permit No. 12-13A and the requirements of 40 CFR 63, Subpart VVVVVV.

1.c Source Description

Solutia uses each of three polykettles as a batch reactor to manufacture polyvinyl butyral resin. Working and breathing loss emissions from each polykettle reactor are vented to atmosphere via a natural draft vent system that is equipped with a process reflux condenser, a vent condenser, and a water scrubber in series. A process flow diagram for the polykettle reactor trains is provided as Figure 1.

Schematic drawings of the polykettle reactors and vent systems showing the emissions sampling locations are provided as Figures 2 through 10.



The production process is used to make two types of resin, alcohol solution (for specialty resin) and bead. This test was conducted during alcohol solution production. The emission units evaluated for AcH, VAc, EtOH, and EtAc emission rates were EU-POLYKETTLE1, EU-POLYKETTLE2, and EU-POLYKETTLE3.

1.d Test Program Contacts

The contact for the source and test report is:

Mr. Charles E. Anderson
Environmental Specialist
Solutia Inc.
5100 West Jefferson Avenue
Trenton, Michigan 48183
(734) 672-7895

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

2. Summary of Results

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

2.a Operating Data

Process data monitored during the emissions test program included the parameters identified in Table 2 and is provided in Appendix B.

The test was conducted under representative operating conditions as allowed by ambient weather conditions. The final temperature is controlled by ambient effects on the vent piping and upon the cooling water circulating as a coolant. The test dates were chosen to comply with the explicit requirement of the permit to test within 180 days and for that reason, choice of a warmer weather condition was restricted. The design and permit application representations were based upon warm summer conditions.

2.b Applicable Permit

Permit No. 12-13A requires verification of the hazardous air pollutant (HAP) control efficiency of the polykettle scrubber control devices.

2.c Results

The overall results of the emission test program are summarized by Tables 3, 4, and 5. Detailed results of each emissions test run are provided as Tables 6 through 29. In addition, run-by-run detailed exhaust gas flowrate; AcH and VAc concentrations; and

resultant AcH and VAc emission rates are included in the electronic files provided in Appendix C.

3. Source Description

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

3.a Process Description

Solutia uses each of three polykettles as a batch reactor to manufacture polyvinyl butyral resin. Working and breathing loss emissions from each polykettle reactor are vented to atmosphere via a natural draft vent system that is equipped with a process reflux condenser, a vent condenser, and a water scrubber in series.

Schematic drawings of the polykettle reactor vent systems showing the emissions sampling locations are provided as Figures 2 through 10.

The production process is used to make two types of resin, alcohol solution (for specialty resin) and bead. This test was conducted during alcohol solution production with the largest quantity of vinyl acetate that is charged to the polykettles.

The emission units evaluated for AcH and VAc emission rates were EU-POLYKETTLE1, EU-POLYKETTLE2, and EU-POLYKETTLE3.

3.b Process Flow Diagram

A schematic drawing of the polykettle reactor and vent systems is provided as Figure 1.

3.c Raw and Finished Materials

Process production and operating data is provided in Appendix B.

3.d Process Capacity

The maximum capacity of each of the three polykettle vessels during alcohol solution production is 2,150 gallons of raw material charged per batch. For all test runs on all three polykettles, the actual batch size was 2,147 gallons. This is the maximum batch size used for alcohol solution production batches of resin.

3.e Process Instrumentation

Relevant process instrumentation is summarized in Table 2.

4. Sampling and Analytical Procedures

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

4.a Sampling Train and Field Procedures

The sampling train for the emissions test program can be separated into the sampling train for measuring exhaust gas flowrates and the sampling train for measuring exhaust gas AcH and VAc concentrations.

Exhaust gas flowrates were measured at each sampling location using a stationary pitot tube and pressure transmitter assembly. At each sampling location, a stationary "S-type" pitot tube (constructed with 1/4" diameter stainless steel tubing) and equipped with a thermocouple was stationed with the pitot tube tip at the centroid of the exhaust duct. The pitot tube was connected to a differential pressure transmitter with a range of 0 to 0.25" H₂O. Specifications for the pressure transmitters are provided in Appendix D. Differential pressure transmitter readings were datalogged at 1 second intervals.

Exhaust gas AcH and VAc concentrations were measured using Fourier Transform Infrared Spectroscopy (FTIR). The FTIR sampling train (for each of the three test location types) consisted of a short length of stainless steel tubing, a heated sample line, the FTIR instrument, and a sample pump. AcH and VAc concentration data were datalogged and averaged at 15 second intervals throughout each emissions test run.

Exhaust gas flowrates were measured using "S-type" pitot tubes stationed with the probe tip at the duct centroid. The pitot tube was connected to the pressure transmitter using sections of tubing, the pressure transmitter was zeroed, and the assembly leak checked. Each pitot tube was equipped with a thermocouple and gas temperatures were measured and recorded at each sampling location at 15-minute intervals. Exhaust gas oxygen concentrations were measured a single time at each sampling location using the Fyrite analysis procedures of Method 3. Exhaust gas carbon dioxide and moisture content were measured using FTIR.

Exhaust gas AcH, VAc, EtOH, and EtAc concentrations were evaluated by Prism Analytical Technologies of Mount Pleasant, Michigan using the procedures of Method 320. Exhaust gas was extracted from the duct prior to the pitot tube through a short section of stainless steel tubing before it entered a heated sample line. The sample line kept the gas at approximately 250 to 300°F before it entered a heated pump followed by the FTIR analyzer. At the condenser inlet and outlet sampling locations, the gas extracted by the FTIR was re-injected to the exhaust pipe after the FTIR withdrawal and before the pitot tube.

Exhaust gas velocity pressure data was recorded at 1-second intervals throughout the emissions test program. During the emissions test program, there were times when there was no flow through the polykettle exhaust system. For any velocity pressure data

recorded that is a negative value, a velocity pressure of zero was substituted. The FTIR sampling system computer and the flow monitoring computer times were synchronized and the FTIR system response time determined. For emission rate calculations, AcH and VAc concentration data were matched with its closest corresponding flow measurement times taking into account the FTIR system response time.

4.b Recovery and Analytical Procedures

This test program did not include laboratory samples and, consequently, sample recovery and analysis is not applicable to this test program.

4.c Sampling Ports

Figures 2 through 10 show relevant sampling port locations.

4.d Traverse Points

Because of the small diameter of each sampling location, all measurements consisted of single point sampling.

5. Test Results and Discussion

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

5.a Results Tabulation

Process data monitored during the emissions test program included the parameters identified in Table 2 and is provided in Appendix B.

5.b Discussion of Results

Tables 3, 4, and 5 summarize the HAP control efficiencies of the overall emissions control system for all three polykettle reactor systems.

5.c Sampling Procedure Variations

For measurement of AcH, VAc, EtOH, and EtOAc concentrations, field quality assurance and quality control procedures included the procedures of Method 320 with the exception that analyte spiking for the vent condenser inlet and outlet sampling locations was conducted while sampling ambient air rather than process exhaust gas. This is because (1) the concentrations are such that it would not allow for sample gas spiking and (2) analyte concentrations were highly variable. In addition, because of the small diameter of each sampling location, all measurements consisted of single point sampling.

Other sampling and analysis procedure variations were as described in the emissions test plan document, the request for alternative methods approvals, and the resulting approvals from U.S. EPA and AQD. The relevant documents are included in Appendix H.



No other variations from the approved emissions test protocol occurred during the testing with the following exceptions:

- (1) Due to a malfunction of the Method 320 sampling system at the condenser outlet sampling location on the EUPOLYKETTLE2 system, emission measurements only included those at the condenser inlet and scrubber outlet sampling locations.
- (2) Exhaust velocity pressure data for Test Run 1 on EUPOLYKETTLE1 was corrupted and could not be retrieved. Consequently, this test run was not used and an additional test run (Test Run 4) was conducted on EUPOLYKETTLE1.

Also, because of the long test runs and the loss of velocity pressure data during the first test run, the velocity pressure datalogger was stopped and re-started at times during the remaining test runs. This resulted in the loss of less than one minute of data during each test run.

5.d Process or Control Device Upsets

No upset conditions occurred during testing.

5.e Control Device Maintenance

There was no major maintenance performed on the air pollution control devices during the three-month period prior to this emissions test.

5.f Re-Test

The emissions test program was not a re-test.

5.g Audit Sample Analyses

No audit samples were collected as part of the test program.

5.h Calibration Sheets

Relevant equipment calibration documents are provided in Appendix E.

5.i Sample Calculations

Sample calculations are provided in Appendix F.

5.j Field Data Sheets

Field documents relevant to the emissions test program are presented in Appendix G.



5.k Laboratory Data

There are no laboratory results for this test program. Raw CEM data is provided electronically in Appendix C. The Method 320 FTIR emissions test report provided by Prism Analytical Technologies is also included in Appendix C.

Table 2
Polykettles 1, 2, and 3 Process Monitoring Parameters
Solutia, Inc.
Trenton, Michigan

Process Operating Parameter	Units
Batch Volume	gallons
Process step start and end times	N/A
Reactor Vessel Pressure	inches H ₂ O
Reactor Vessel Temperature	°C
Vent Condenser Exhaust Outlet Temperature	°F
Water flowrate, scrubber	gallons/min
Water Flowrate, Trane (main supply) chiller system, for EU-POLYKETTLE1, EU-POLYKETTLE2, and EU-PREDISSOLVER	gallons/min
Coolant supply fluid temperature, Trane (main supply) chiller system	°F
Scrubber Water Specific Gravity	-
Scrubber Water Temperature	°F

Table 3
Polykettle #1 Acetaldehyde, Vinyl Acetate, Ethanol, and Ethyl Acetate Emissions Test Results Summary
Alcohol Solution Production
Solutia Inc.
Trenton, Michigan

Test Run No.	Test Starting Date	Test Run Start Time	Test Run End Time	Condenser Inlet Acetaldehyde Emission Rate (lbs/hr)	Condenser Inlet Vinyl Acetate Emission Rate (lbs/hr)	Condenser Inlet Ethanol Emission Rate (lbs/hr)	Condenser Inlet Ethyl Acetate Emission Rate (lbs/hr)	Condenser Outlet Acetaldehyde Emission Rate (lbs/hr)	Condenser Outlet Vinyl Acetate Emission Rate (lbs/hr)	Condenser Outlet Ethanol Emission Rate (lbs/hr)	Condenser Outlet Ethyl Acetate Emission Rate (lbs/hr)	Scrubber Outlet Acetaldehyde Emission Rate (lbs/hr)	Scrubber Outlet Vinyl Acetate Emission Rate (lbs/hr)	Scrubber Outlet Ethanol Emission Rate (lbs/hr)	Scrubber Outlet Ethyl Acetate Emission Rate (lbs/hr)	Overall HAP Control Efficiency (%)
2	4/30/2018	19:04	4:06	0.01	1.69	0.24	0.01	0.001	0.15	0.01	0.001	0.000000	0.000170	0.000008	0.000008	99.99
3	5/1/2018	4:47	13:48	0.01	1.84	0.28	0.01	0.001	0.15	0.01	0.001	0.000001	0.000189	0.000008	0.000008	99.99
4	5/1/2018	14:31	23:01	0.01	2.99	0.50	0.01	0.001	0.11	0.01	0.002	0.000000	0.001152	0.000017	0.000039	99.96
Averages:				0.01	2.17	0.34	0.01	0.001	0.14	0.01	0.001	0.000000	0.000504	0.000011	0.000018	99.98

Table 4
Polykettle #2 Acetaldehyde, Vinyl Acetate, Ethanol, and Ethyl Acetate Emissions Test Results Summary
Alcohol Solution Production
Solutia Inc.
Trenton, Michigan

Test Run No.	Test Starting Date	Test Run Start Time	Test Run End Time	Condenser Inlet Acetaldehyde Emission Rate (lbs/hr)	Condenser Inlet Vinyl Acetate Emission Rate (lbs/hr)	Condenser Inlet Ethanol Emission Rate (lbs/hr)	Condenser Inlet Ethyl Acetate Emission Rate (lbs/hr)	Scrubber Outlet Acetaldehyde Emission Rate (lbs/hr)	Scrubber Outlet Vinyl Acetate Emission Rate (lbs/hr)	Scrubber Outlet Ethanol Emission Rate (lbs/hr)	Scrubber Outlet Ethyl Acetate Emission Rate (lbs/hr)	Overall HAP Control Efficiency (%)
1	5/2/2018	4:30	13:11	0.00	1.48	0.23	0.01	0.000001	0.002361	0.000000	0.000111	99.84
2	5/2/2018	13:54	22:44	0.01	2.23	0.39	0.01	0.000001	0.002561	0.000003	0.000097	99.89
3	5/2/2018	23:35	8:28	0.00	1.19	0.17	0.01	0.000001	0.002921	0.000001	0.000113	99.75
Averages:				0.00	1.63	0.26	0.01	0.000001	0.002614	0.000001	0.000107	99.83

Table 5
Polykettle #3 Acetaldehyde, Vinyl Acetate, Ethanol, and Ethyl Acetate Emissions Test Results Summary
Alcohol Solution Production
Solutia Inc.
Trenton, Michigan

Test Run No.	Test Starting Date	Test Run Start Time	Test Run End Time	Condenser Inlet Acetaldehyde Emission Rate (lbs/hr)	Condenser Inlet Vinyl Acetate Emission Rate (lbs/hr)	Condenser Inlet Ethanol Emission Rate (lbs/hr)	Condenser Inlet Ethyl Acetate Emission Rate (lbs/hr)	Condenser Outlet Acetaldehyde Emission Rate (lbs/hr)	Condenser Outlet Vinyl Acetate Emission Rate (lbs/hr)	Condenser Outlet Ethanol Emission Rate (lbs/hr)	Condenser Outlet Ethyl Acetate Emission Rate (lbs/hr)	Scrubber Outlet Acetaldehyde Emission Rate (lbs/hr)	Scrubber Outlet Vinyl Acetate Emission Rate (lbs/hr)	Scrubber Outlet Ethanol Emission Rate (lbs/hr)	Scrubber Outlet Ethyl Acetate Emission Rate (lbs/hr)	Overall HAP Control Efficiency (%)
1	5/3/2018	13:16	22:28	0.002	0.38	0.06	0.001	0.001	0.11	0.01	0.001	0.000000	0.004385	0.000004	0.000125	98.86
2	5/3/2018	23:10	8:30	0.001	0.18	0.03	0.001	0.001	0.19	0.02	0.001	0.000001	0.004031	0.000002	0.000113	97.76
3	5/4/2018	9:19	18:22	0.002	0.32	0.05	0.001	0.002	0.21	0.02	0.002	0.000000	0.004360	0.000003	0.000000	98.63
Averages:				0.002	0.29	0.05	0.001	0.002	0.17	0.02	0.001	0.000000	0.004259	0.000003	0.000079	98.41

TABLE 6
PK1, R2 CONDENSER INLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION PRODUCTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#1
Sampling Location:	Condenser Inlet
Test Run No.	2
Pressure Transmitter ID:	PT#5
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.47
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	1.13
Exhaust Gas Acetaldehyde Content (%):	0.25
Exhaust Gas Vinyl Acetate Content (%):	6.82
Exhaust Gas Ethanol Content (%):	2.09
Exhaust Gas Ethyl Acetate Content (%):	0.05
Exhaust Gas Moisture Content (%):	0.74
FTIR Response Time (s)	23
Sample Run Start Time:	19:04:00
Sample Run End Time:	4:06:00
Test Run Results	
Sampling Location Area (ft ²):	0.06
Average Velocity Pressure (in. H2O):	0.000
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.061
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2})	0.008
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2})	0.248
Exhaust Gas Molecular Weight:	33.4
Stack Gas Static Pressure (in. Hg):	29.47
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	1.5
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	1.5
Maximum Exhaust Gas Flowrate (acfm):	44.9
Maximum Exhaust Gas Flowrate (scfm):	45.1
Average Acetaldehyde Emission Rate (lbs/hr):	0.01
Average Vinyl Acetate Emission Rate (lbs/hr):	1.69
Average Ethanol Emission Rate (lbs/hr):	0.24
Average Ethyl Acetate Emission Rate (lbs/hr):	0.01
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.41
Maximum Vinyl Acetate Emission Rate (lbs/hr):	44.64
Maximum Ethanol Emission Rate (lbs/hr):	7.56
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.31

TABLE 7
PK1, R2 CONDENSER OUTLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#1
Sampling Location:	Condenser Outlet
Test Run No.	2
Pressure Transmitter ID:	PT#6
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.47
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	1.43
Exhaust Gas Acetaldehyde Content (%):	0.06
Exhaust Gas Vinyl Acetate Content (%):	2.33
Exhaust Gas Ethanol Content (%):	0.32
Exhaust Gas Ethyl Acetate Content (%):	0.03
Exhaust Gas Moisture Content (%):	1.34
FTIR Response Time (s)	23
Sample Run Start Time:	19:04:00
Sample Run End Time:	4:06:00
Test Run Results	
Sampling Location Area (ft2):	0.06
Average Velocity Pressure (in. H2O):	-0.001
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.060
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2})	0.003
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2})	0.246
Exhaust Gas Molecular Weight:	30.4
Stack Gas Static Pressure (in. Hg):	29.47
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	0.5
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	0.5
Maximum Exhaust Gas Flowrate (acfm):	46.6
Maximum Exhaust Gas Flowrate (scfm):	46.9
Average Acetaldehyde Emission Rate (lbs/hr):	0.00
Average Vinyl Acetate Emission Rate (lbs/hr):	0.15
Average Ethanol Emission Rate (lbs/hr):	0.01
Average Ethyl Acetate Emission Rate (lbs/hr):	0.00
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.11
Maximum Vinyl Acetate Emission Rate (lbs/hr):	11.02
Maximum Ethanol Emission Rate (lbs/hr):	0.73
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.18

TABLE 8
PK1, R2 SCRUBBER OUTLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#1
Sampling Location:	Scrubber Outlet
Test Run No.	2
Pressure Transmitter ID:	PT#4
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.47
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	0.42
Exhaust Gas Acetaldehyde Content (%):	0.00
Exhaust Gas Vinyl Acetate Content (%):	0.00
Exhaust Gas Ethanol Content (%):	0.00
Exhaust Gas Ethyl Acetate Content (%):	0.00
Exhaust Gas Moisture Content (%):	1.21
FTIR Response Time (s)	23
Sample Run Start Time:	19:04:00
Sample Run End Time:	4:06:00
Test Run Results	
Sampling Location Area (ft2):	0.06
Average Velocity Pressure (in. H2O):	-0.001
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.052
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2})	0.003
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2})	0.228
Exhaust Gas Molecular Weight:	28.8
Stack Gas Static Pressure (in. Hg):	29.47
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	0.6
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	0.6
Maximum Exhaust Gas Flowrate (acfm):	44.6
Maximum Exhaust Gas Flowrate (scfm):	44.4
Average Acetaldehyde Emission Rate (lbs/hr):	0.00000
Average Vinyl Acetate Emission Rate (lbs/hr):	0.00017
Average Ethanol Emission Rate (lbs/hr):	0.00001
Average Ethyl Acetate Emission Rate (lbs/hr):	0.00001
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.00013
Maximum Vinyl Acetate Emission Rate (lbs/hr):	0.25536
Maximum Ethanol Emission Rate (lbs/hr):	0.00064
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.00610

TABLE 9
PK1, R3 CONDENSER INLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#1
Sampling Location:	Condenser Inlet
Test Run No.	3
Pressure Transmitter ID:	PT#5
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.42
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	1.09
Exhaust Gas Acetaldehyde Content (%):	0.23
Exhaust Gas Vinyl Acetate Content (%):	7.98
Exhaust Gas Ethanol Content (%):	2.67
Exhaust Gas Ethyl Acetate Content (%):	0.06
Exhaust Gas Moisture Content (%):	0.92
FTIR Response Time (s)	23
Sample Run Start Time:	4:47:00
Sample Run End Time:	13:48:00
Test Run Results	
Sampling Location Area (ft2):	0.06
Average Velocity Pressure (in. H2O):	0.000
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.065
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2})	0.008
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2})	0.255
Exhaust Gas Molecular Weight:	34.1
Stack Gas Static Pressure (in. Hg):	29.42
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	1.5
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	1.5
Maximum Exhaust Gas Flowrate (acfm):	45.9
Maximum Exhaust Gas Flowrate (scfm):	45.7
Average Acetaldehyde Emission Rate (lbs/hr):	0.01
Average Vinyl Acetate Emission Rate (lbs/hr):	1.84
Average Ethanol Emission Rate (lbs/hr):	0.28
Average Ethyl Acetate Emission Rate (lbs/hr):	0.01
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.43
Maximum Vinyl Acetate Emission Rate (lbs/hr):	73.21
Maximum Ethanol Emission Rate (lbs/hr):	10.87
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.30

TABLE 10
PK1, R3 CONDENSER OUTLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#1
Sampling Location:	Condenser Outlet
Test Run No.	3
Pressure Transmitter ID:	PT#6
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.42
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	1.31
Exhaust Gas Acetaldehyde Content (%):	0.07
Exhaust Gas Vinyl Acetate Content (%):	2.49
Exhaust Gas Ethanol Content (%):	0.44
Exhaust Gas Ethyl Acetate Content (%):	0.02
Exhaust Gas Moisture Content (%):	2.13
FTIR Response Time (s)	23
Sample Run Start Time:	4:47:00
Sample Run End Time:	13:48:00
Test Run Results	
Sampling Location Area (ft2):	0.06
Average Velocity Pressure (in. H2O):	-0.001
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.063
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2})	0.003
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2})	0.250
Exhaust Gas Molecular Weight:	30.4
Stack Gas Static Pressure (in. Hg):	29.42
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	0.5
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	0.5
Maximum Exhaust Gas Flowrate (acfm):	47.5
Maximum Exhaust Gas Flowrate (scfm):	47.7
Average Acetaldehyde Emission Rate (lbs/hr):	0.00
Average Vinyl Acetate Emission Rate (lbs/hr):	0.15
Average Ethanol Emission Rate (lbs/hr):	0.01
Average Ethyl Acetate Emission Rate (lbs/hr):	0.00
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.09
Maximum Vinyl Acetate Emission Rate (lbs/hr):	14.93
Maximum Ethanol Emission Rate (lbs/hr):	0.64
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.14

TABLE 11
PK1, R3 SCRUBBER OUTLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#1
Sampling Location:	Scrubber Outlet
Test Run No.	3
Pressure Transmitter ID:	PT#4
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.42
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	0.38
Exhaust Gas Acetaldehyde Content (%):	0.00
Exhaust Gas Vinyl Acetate Content (%):	0.00
Exhaust Gas Ethanol Content (%):	0.00
Exhaust Gas Ethyl Acetate Content (%):	0.00
Exhaust Gas Moisture Content (%):	1.16
FTIR Response Time (s)	23
Sample Run Start Time:	19:04:00
Sample Run End Time:	4:06:00
Test Run Results	
Sampling Location Area (ft ²):	0.06
Average Velocity Pressure (in. H2O):	-0.001
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.054
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2}):	0.003
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2}):	0.232
Exhaust Gas Molecular Weight:	28.8
Stack Gas Static Pressure (in. Hg):	29.42
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	0.6
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	0.6
Maximum Exhaust Gas Flowrate (acfm):	45.3
Maximum Exhaust Gas Flowrate (scfm):	45.2
Average Acetaldehyde Emission Rate (lbs/hr):	0.00000
Average Vinyl Acetate Emission Rate (lbs/hr):	0.00019
Average Ethanol Emission Rate (lbs/hr):	0.00001
Average Ethyl Acetate Emission Rate (lbs/hr):	0.00001
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.00031
Maximum Vinyl Acetate Emission Rate (lbs/hr):	0.29421
Maximum Ethanol Emission Rate (lbs/hr):	0.00090
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.00717

TABLE 12
PK1, R4 CONDENSER INLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#1
Sampling Location:	Condenser Inlet
Test Run No.	4
Pressure Transmitter ID:	PT#5
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.40
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	1.02
Exhaust Gas Acetaldehyde Content (%):	0.22
Exhaust Gas Vinyl Acetate Content (%):	9.36
Exhaust Gas Ethanol Content (%):	3.28
Exhaust Gas Ethyl Acetate Content (%):	0.07
Exhaust Gas Moisture Content (%):	1.02
FTIR Response Time (s)	23
Sample Run Start Time:	14:31:00
Sample Run End Time:	23:01:00
Test Run Results	
Sampling Location Area (ft ²):	0.06
Average Velocity Pressure (in. H2O):	0.000
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.001
Maximum Velocity Pressure (in. H2O):	0.062
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2}):	0.011
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2}):	0.250
Exhaust Gas Molecular Weight:	35.0
Stack Gas Static Pressure (in. Hg):	29.40
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	2.0
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	1.9
Maximum Exhaust Gas Flowrate (acfm):	45.5
Maximum Exhaust Gas Flowrate (scfm):	43.2
Average Acetaldehyde Emission Rate (lbs/hr):	0.01
Average Vinyl Acetate Emission Rate (lbs/hr):	2.99
Average Ethanol Emission Rate (lbs/hr):	0.50
Average Ethyl Acetate Emission Rate (lbs/hr):	0.01
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.32
Maximum Vinyl Acetate Emission Rate (lbs/hr):	56.16
Maximum Ethanol Emission Rate (lbs/hr):	9.54
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.42

TABLE 13
PK1, R4 CONDENSER OUTLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#1
Sampling Location:	Condenser Outlet
Test Run No.	4
Pressure Transmitter ID:	PT#6
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.40
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	1.41
Exhaust Gas Acetaldehyde Content (%):	0.08
Exhaust Gas Vinyl Acetate Content (%):	2.47
Exhaust Gas Ethanol Content (%):	0.50
Exhaust Gas Ethyl Acetate Content (%):	0.03
Exhaust Gas Moisture Content (%):	2.83
FTIR Response Time (s)	23
Sample Run Start Time:	14:31:00
Sample Run End Time:	23:11:00
Test Run Results	
Sampling Location Area (ft2):	0.06
Average Velocity Pressure (in. H2O):	-0.001
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.058
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2})	0.002
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2})	0.241
Exhaust Gas Molecular Weight:	30.3
Stack Gas Static Pressure (in. Hg):	29.40
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	0.5
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	0.4
Maximum Exhaust Gas Flowrate (acfm):	46.7
Maximum Exhaust Gas Flowrate (scfm):	45.1
Average Acetaldehyde Emission Rate (lbs/hr):	0.00
Average Vinyl Acetate Emission Rate (lbs/hr):	0.11
Average Ethanol Emission Rate (lbs/hr):	0.01
Average Ethyl Acetate Emission Rate (lbs/hr):	0.00
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.07
Maximum Vinyl Acetate Emission Rate (lbs/hr):	8.52
Maximum Ethanol Emission Rate (lbs/hr):	1.05
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.42

TABLE 14
PK1, R4 SCRUBBER OUTLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#1
Sampling Location:	Scrubber Outlet
Test Run No.	4
Pressure Transmitter ID:	PT#4
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.40
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	0.34
Exhaust Gas Acetaldehyde Content (%):	0.00
Exhaust Gas Vinyl Acetate Content (%):	0.00
Exhaust Gas Ethanol Content (%):	0.00
Exhaust Gas Ethyl Acetate Content (%):	0.00
Exhaust Gas Moisture Content (%):	1.43
FTIR Response Time (s)	23
Sample Run Start Time:	14:31:00
Sample Run End Time:	23:11:00
Test Run Results	
Sampling Location Area (ft2):	0.06
Average Velocity Pressure (in. H2O):	-0.001
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.047
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2}):	0.003
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2}):	0.216
Exhaust Gas Molecular Weight:	28.8
Stack Gas Static Pressure (in. Hg):	29.40
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	0.6
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	0.6
Maximum Exhaust Gas Flowrate (acfm):	43.0
Maximum Exhaust Gas Flowrate (scfm):	41.6
Average Acetaldehyde Emission Rate (lbs/hr):	0.00000
Average Vinyl Acetate Emission Rate (lbs/hr):	0.00115
Average Ethanol Emission Rate (lbs/hr):	0.00002
Average Ethyl Acetate Emission Rate (lbs/hr):	0.00004
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.00015
Maximum Vinyl Acetate Emission Rate (lbs/hr):	0.50230
Maximum Ethanol Emission Rate (lbs/hr):	0.00138
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.01133

TABLE 15
PK2, R1 CONDENSER INLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#2
Sampling Location:	Condenser Inlet
Test Run No.	1
Pressure Transmitter ID:	PT#5
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.37
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	1.43
Exhaust Gas Acetaldehyde Content (%):	0.19
Exhaust Gas Vinyl Acetate Content (%):	8.39
Exhaust Gas Ethanol Content (%):	2.82
Exhaust Gas Ethyl Acetate Content (%):	0.07
Exhaust Gas Moisture Content (%):	0.88
FTIR Response Time (s)	23
Sample Run Start Time:	4:30:00
Sample Run End Time:	13:11:00
Test Run Results	
Sampling Location Area (ft ²):	0.06
Average Velocity Pressure (in. H2O):	0.000
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.060
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2}):	0.006
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2}):	0.246
Exhaust Gas Molecular Weight:	34.4
Stack Gas Static Pressure (in. Hg):	29.37
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	1.1
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	1.1
Maximum Exhaust Gas Flowrate (acfm):	43.8
Maximum Exhaust Gas Flowrate (scfm):	44.1
Average Acetaldehyde Emission Rate (lbs/hr):	0.00
Average Vinyl Acetate Emission Rate (lbs/hr):	1.48
Average Ethanol Emission Rate (lbs/hr):	0.23
Average Ethyl Acetate Emission Rate (lbs/hr):	0.01
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.21
Maximum Vinyl Acetate Emission Rate (lbs/hr):	44.92
Maximum Ethanol Emission Rate (lbs/hr):	7.52
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.47

TABLE 16
PK2, R1 SCRUBBER OUTLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#2
Sampling Location:	Scrubber Outlet
Test Run No.	1
Pressure Transmitter ID:	PT#4
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.37
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	0.42
Exhaust Gas Acetaldehyde Content (%):	0.00
Exhaust Gas Vinyl Acetate Content (%):	0.00
Exhaust Gas Ethanol Content (%):	0.00
Exhaust Gas Ethyl Acetate Content (%):	0.00
Exhaust Gas Moisture Content (%):	1.51
FTIR Response Time (s)	23
Sample Run Start Time:	4:30:00
Sample Run End Time:	13:11:00
Test Run Results	
Sampling Location Area (ft2):	0.06
Average Velocity Pressure (in. H2O):	-0.001
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.057
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2}):	0.003
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2}):	0.239
Exhaust Gas Molecular Weight:	28.8
Stack Gas Static Pressure (in. Hg):	29.37
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	0.6
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	0.6
Maximum Exhaust Gas Flowrate (acfm):	46.9
Maximum Exhaust Gas Flowrate (scfm):	46.5
Average Acetaldehyde Emission Rate (lbs/hr):	0.00000
Average Vinyl Acetate Emission Rate (lbs/hr):	0.00236
Average Ethanol Emission Rate (lbs/hr):	0.00000
Average Ethyl Acetate Emission Rate (lbs/hr):	0.00011
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.00030
Maximum Vinyl Acetate Emission Rate (lbs/hr):	1.02477
Maximum Ethanol Emission Rate (lbs/hr):	0.00067
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.02460

TABLE 17
PK2, R2 CONDENSER INLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#2
Sampling Location:	Condenser Inlet
Test Run No.	2
Pressure Transmitter ID:	PT#5
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.31
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	1.24
Exhaust Gas Acetaldehyde Content (%):	0.18
Exhaust Gas Vinyl Acetate Content (%):	9.34
Exhaust Gas Ethanol Content (%):	3.26
Exhaust Gas Ethyl Acetate Content (%):	0.07
Exhaust Gas Moisture Content (%):	0.96
FTIR Response Time (s)	23
Sample Run Start Time:	13:54:00
Sample Run End Time:	22:44:00
Test Run Results	
Sampling Location Area (ft2):	0.06
Average Velocity Pressure (in. H2O):	0.000
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.063
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2})	0.007
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2})	0.252
Exhaust Gas Molecular Weight:	35.0
Stack Gas Static Pressure (in. Hg):	29.31
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	1.4
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	1.3
Maximum Exhaust Gas Flowrate (acfm):	45.7
Maximum Exhaust Gas Flowrate (scfm):	43.5
Average Acetaldehyde Emission Rate (lbs/hr):	0.01
Average Vinyl Acetate Emission Rate (lbs/hr):	2.23
Average Ethanol Emission Rate (lbs/hr):	0.39
Average Ethyl Acetate Emission Rate (lbs/hr):	0.01
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.39
Maximum Vinyl Acetate Emission Rate (lbs/hr):	64.62
Maximum Ethanol Emission Rate (lbs/hr):	8.49
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.47

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TABLE 18
PK2, R2 SCRUBBER OUTLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#2
Sampling Location:	Scrubber Outlet
Test Run No.	2
Pressure Transmitter ID:	PT#4
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.31
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	0.36
Exhaust Gas Acetaldehyde Content (%):	0.00
Exhaust Gas Vinyl Acetate Content (%):	0.00
Exhaust Gas Ethanol Content (%):	0.00
Exhaust Gas Ethyl Acetate Content (%):	0.00
Exhaust Gas Moisture Content (%):	2.15
FTIR Response Time (s)	23
Sample Run Start Time:	13:54:00
Sample Run End Time:	22:44:00
Test Run Results	
Sampling Location Area (ft2):	0.06
Average Velocity Pressure (in. H2O):	-0.001
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.055
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2})	0.003
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2})	0.235
Exhaust Gas Molecular Weight:	28.7
Stack Gas Static Pressure (in. Hg):	29.31
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	0.6
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	0.6
Maximum Exhaust Gas Flowrate (acfm):	47.2
Maximum Exhaust Gas Flowrate (scfm):	45.0
Average Acetaldehyde Emission Rate (lbs/hr):	0.00000
Average Vinyl Acetate Emission Rate (lbs/hr):	0.00256
Average Ethanol Emission Rate (lbs/hr):	0.00000
Average Ethyl Acetate Emission Rate (lbs/hr):	0.00010
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.00014
Maximum Vinyl Acetate Emission Rate (lbs/hr):	1.15393
Maximum Ethanol Emission Rate (lbs/hr):	0.00117
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.02217

TABLE 19
PK2, R3 CONDENSER INLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#2
Sampling Location:	Condenser Inlet
Test Run No.	3
Pressure Transmitter ID:	PT#5
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.34
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	1.45
Exhaust Gas Acetaldehyde Content (%):	0.17
Exhaust Gas Vinyl Acetate Content (%):	7.20
Exhaust Gas Ethanol Content (%):	2.35
Exhaust Gas Ethyl Acetate Content (%):	0.07
Exhaust Gas Moisture Content (%):	0.79
FTIR Response Time (s)	23
Sample Run Start Time:	23:35:00
Sample Run End Time:	8:28:00
Test Run Results	
Sampling Location Area (ft ²):	0.06
Average Velocity Pressure (in. H2O):	0.000
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.059
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2})	0.006
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2})	0.242
Exhaust Gas Molecular Weight:	33.7
Stack Gas Static Pressure (in. Hg):	29.34
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	1.1
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	1.1
Maximum Exhaust Gas Flowrate (acfm):	44.0
Maximum Exhaust Gas Flowrate (scfm):	43.5
Average Acetaldehyde Emission Rate (lbs/hr):	0.00
Average Vinyl Acetate Emission Rate (lbs/hr):	1.19
Average Ethanol Emission Rate (lbs/hr):	0.17
Average Ethyl Acetate Emission Rate (lbs/hr):	0.01
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.24
Maximum Vinyl Acetate Emission Rate (lbs/hr):	36.24
Maximum Ethanol Emission Rate (lbs/hr):	4.37
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.20

TABLE 20
PK2, R3 SCRUBBER OUTLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#2
Sampling Location:	Scrubber Outlet
Test Run No.	3
Pressure Transmitter ID:	PT#4
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.34
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	0.42
Exhaust Gas Acetaldehyde Content (%):	0.00
Exhaust Gas Vinyl Acetate Content (%):	0.00
Exhaust Gas Ethanol Content (%):	0.00
Exhaust Gas Ethyl Acetate Content (%):	0.00
Exhaust Gas Moisture Content (%):	2.17
FTIR Response Time (s)	23
Sample Run Start Time:	23:35:00
Sample Run End Time:	8:28:00
Test Run Results	
Sampling Location Area (ft2):	0.06
Average Velocity Pressure (in. H2O):	-0.001
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.056
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2})	0.002
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2})	0.237
Exhaust Gas Molecular Weight:	28.7
Stack Gas Static Pressure (in. Hg):	29.34
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	0.5
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	0.5
Maximum Exhaust Gas Flowrate (acfm):	46.6
Maximum Exhaust Gas Flowrate (scfm):	46.0
Average Acetaldehyde Emission Rate (lbs/hr):	0.00000
Average Vinyl Acetate Emission Rate (lbs/hr):	0.00292
Average Ethanol Emission Rate (lbs/hr):	0.00000
Average Ethyl Acetate Emission Rate (lbs/hr):	0.00011
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.00019
Maximum Vinyl Acetate Emission Rate (lbs/hr):	1.14354
Maximum Ethanol Emission Rate (lbs/hr):	0.00052
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.02470

TABLE 21
PK3, R1 CONDENSER INLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#3
Sampling Location:	Condenser Inlet
Test Run No.	1
Pressure Transmitter ID:	PT#5
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.31
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	1.05
Exhaust Gas Acetaldehyde Content (%):	0.23
Exhaust Gas Vinyl Acetate Content (%):	8.42
Exhaust Gas Ethanol Content (%):	3.00
Exhaust Gas Ethyl Acetate Content (%):	0.06
Exhaust Gas Moisture Content (%):	0.88
FTIR Response Time (s)	16
Sample Run Start Time:	13:16:00
Sample Run End Time:	22:28:00
Test Run Results	
Sampling Location Area (ft ²):	0.06
Average Velocity Pressure (in. H2O):	-0.001
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.188
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2})	0.002
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2})	0.434
Exhaust Gas Molecular Weight:	34.4
Stack Gas Static Pressure (in. Hg):	29.31
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	0.4
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	0.4
Maximum Exhaust Gas Flowrate (acfm):	78.6
Maximum Exhaust Gas Flowrate (scfm):	76.7
Average Acetaldehyde Emission Rate (lbs/hr):	0.00
Average Vinyl Acetate Emission Rate (lbs/hr):	0.38
Average Ethanol Emission Rate (lbs/hr):	0.06
Average Ethyl Acetate Emission Rate (lbs/hr):	0.00
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.24
Maximum Vinyl Acetate Emission Rate (lbs/hr):	31.30
Maximum Ethanol Emission Rate (lbs/hr):	5.01
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.18

TABLE 22
PK3, R1 CONDENSER OUTLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#3
Sampling Location:	Condenser Outlet
Test Run No.	1
Pressure Transmitter ID:	PT#6
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.31
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	1.21
Exhaust Gas Acetaldehyde Content (%):	0.09
Exhaust Gas Vinyl Acetate Content (%):	2.48
Exhaust Gas Ethanol Content (%):	0.48
Exhaust Gas Ethyl Acetate Content (%):	0.04
Exhaust Gas Moisture Content (%):	1.09
FTIR Response Time (s)	23
Sample Run Start Time:	13:16:00
Sample Run End Time:	22:28:00
Test Run Results	
Sampling Location Area (ft2):	0.06
Average Velocity Pressure (in. H2O):	-0.002
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.019
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2}):	0.001
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2}):	0.136
Exhaust Gas Molecular Weight:	30.5
Stack Gas Static Pressure (in. Hg):	29.31
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	0.3
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	0.2
Maximum Exhaust Gas Flowrate (acfm):	25.9
Maximum Exhaust Gas Flowrate (scfm):	25.9
Average Acetaldehyde Emission Rate (lbs/hr):	0.00
Average Vinyl Acetate Emission Rate (lbs/hr):	0.11
Average Ethanol Emission Rate (lbs/hr):	0.01
Average Ethyl Acetate Emission Rate (lbs/hr):	0.00
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.63
Maximum Vinyl Acetate Emission Rate (lbs/hr):	11.61
Maximum Ethanol Emission Rate (lbs/hr):	1.53
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.29

TABLE 23
PK3, R1 SCRUBBER OUTLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#3
Sampling Location:	Scrubber Outlet
Test Run No.	1
Pressure Transmitter ID:	PT#4
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.31
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	0.31
Exhaust Gas Acetaldehyde Content (%):	0.00
Exhaust Gas Vinyl Acetate Content (%):	0.00
Exhaust Gas Ethanol Content (%):	0.00
Exhaust Gas Ethyl Acetate Content (%):	0.00
Exhaust Gas Moisture Content (%):	2.48
FTIR Response Time (s)	23
Sample Run Start Time:	13:16:00
Sample Run End Time:	22:28:00
Test Run Results	
Sampling Location Area (ft2):	0.06
Average Velocity Pressure (in. H2O):	-0.002
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.053
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2})	0.002
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2})	0.230
Exhaust Gas Molecular Weight:	28.6
Stack Gas Static Pressure (in. Hg):	29.31
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	0.3
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	0.3
Maximum Exhaust Gas Flowrate (acfm):	45.8
Maximum Exhaust Gas Flowrate (scfm):	44.5
Average Acetaldehyde Emission Rate (lbs/hr):	0.00000
Average Vinyl Acetate Emission Rate (lbs/hr):	0.00438
Average Ethanol Emission Rate (lbs/hr):	0.00000
Average Ethyl Acetate Emission Rate (lbs/hr):	0.00012
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.00020
Maximum Vinyl Acetate Emission Rate (lbs/hr):	1.85613
Maximum Ethanol Emission Rate (lbs/hr):	0.00192
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.03833

TABLE 24
PK3, R2 CONDENSER INLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#3
Sampling Location:	Condenser Inlet
Test Run No.	2
Pressure Transmitter ID:	PT#5
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.32
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	1.16
Exhaust Gas Acetaldehyde Content (%):	0.23
Exhaust Gas Vinyl Acetate Content (%):	7.23
Exhaust Gas Ethanol Content (%):	2.50
Exhaust Gas Ethyl Acetate Content (%):	0.06
Exhaust Gas Moisture Content (%):	0.73
FTIR Response Time (s)	16
Sample Run Start Time:	23:10:00
Sample Run End Time:	8:30:00
Test Run Results	
Sampling Location Area (ft2):	0.06
Average Velocity Pressure (in. H2O):	-0.001
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.188
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2})	0.002
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2})	0.434
Exhaust Gas Molecular Weight:	33.7
Stack Gas Static Pressure (in. Hg):	29.32
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	0.3
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	0.3
Maximum Exhaust Gas Flowrate (acfm):	79.3
Maximum Exhaust Gas Flowrate (scfm):	77.4
Average Acetaldehyde Emission Rate (lbs/hr):	0.00
Average Vinyl Acetate Emission Rate (lbs/hr):	0.18
Average Ethanol Emission Rate (lbs/hr):	0.03
Average Ethyl Acetate Emission Rate (lbs/hr):	0.00
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.25
Maximum Vinyl Acetate Emission Rate (lbs/hr):	24.97
Maximum Ethanol Emission Rate (lbs/hr):	3.61
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.13

TABLE 25
PK3, R2 CONDENSER OUTLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#3
Sampling Location:	Condenser Outlet
Test Run No.	2
Pressure Transmitter ID:	PT#6
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.32
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	1.43
Exhaust Gas Acetaldehyde Content (%):	0.10
Exhaust Gas Vinyl Acetate Content (%):	2.51
Exhaust Gas Ethanol Content (%):	0.47
Exhaust Gas Ethyl Acetate Content (%):	0.04
Exhaust Gas Moisture Content (%):	0.97
FTIR Response Time (s)	23
Sample Run Start Time:	23:10:00
Sample Run End Time:	8:30:00
Test Run Results	
Sampling Location Area (ft2):	0.06
Average Velocity Pressure (in. H2O):	-0.002
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.060
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2}):	0.003
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2}):	0.244
Exhaust Gas Molecular Weight:	30.6
Stack Gas Static Pressure (in. Hg):	29.32
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	0.5
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	0.5
Maximum Exhaust Gas Flowrate (acfm):	46.4
Maximum Exhaust Gas Flowrate (scfm):	46.3
Average Acetaldehyde Emission Rate (lbs/hr):	0.00
Average Vinyl Acetate Emission Rate (lbs/hr):	0.19
Average Ethanol Emission Rate (lbs/hr):	0.02
Average Ethyl Acetate Emission Rate (lbs/hr):	0.00
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.61
Maximum Vinyl Acetate Emission Rate (lbs/hr):	17.74
Maximum Ethanol Emission Rate (lbs/hr):	1.93
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.29

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TABLE 26
PK3, R2 SCRUBBER OUTLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#3
Sampling Location:	Scrubber Outlet
Test Run No.	2
Pressure Transmitter ID:	PT#4
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.32
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	0.47
Exhaust Gas Acetaldehyde Content (%):	0.00
Exhaust Gas Vinyl Acetate Content (%):	0.00
Exhaust Gas Ethanol Content (%):	0.00
Exhaust Gas Ethyl Acetate Content (%):	0.00
Exhaust Gas Moisture Content (%):	2.03
FTIR Response Time (s)	23
Sample Run Start Time:	23:10:00
Sample Run End Time:	8:30:00
Test Run Results	
Sampling Location Area (ft2):	0.06
Average Velocity Pressure (in. H2O):	-0.002
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.054
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2})	0.002
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2})	0.232
Exhaust Gas Molecular Weight:	28.7
Stack Gas Static Pressure (in. Hg):	29.32
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	0.3
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	0.3
Maximum Exhaust Gas Flowrate (acfm):	45.5
Maximum Exhaust Gas Flowrate (scfm):	45.5
Average Acetaldehyde Emission Rate (lbs/hr):	0.00000
Average Vinyl Acetate Emission Rate (lbs/hr):	0.00403
Average Ethanol Emission Rate (lbs/hr):	0.00000
Average Ethyl Acetate Emission Rate (lbs/hr):	0.00011
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.00022
Maximum Vinyl Acetate Emission Rate (lbs/hr):	1.83273
Maximum Ethanol Emission Rate (lbs/hr):	0.00123
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.03030

TABLE 27
PK3, R3 CONDENSER INLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#3
Sampling Location:	Condenser Inlet
Test Run No.	3
Pressure Transmitter ID:	PT#5
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.07
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	1.05
Exhaust Gas Acetaldehyde Content (%):	0.24
Exhaust Gas Vinyl Acetate Content (%):	8.29
Exhaust Gas Ethanol Content (%):	2.92
Exhaust Gas Ethyl Acetate Content (%):	0.05
Exhaust Gas Moisture Content (%):	0.86
FTIR Response Time (s)	16
Sample Run Start Time:	9:19:00
Sample Run End Time:	18:22:00
Test Run Results	
Sampling Location Area (ft2):	0.06
Average Velocity Pressure (in. H2O):	-0.001
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.215
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2})	0.002
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2})	0.464
Exhaust Gas Molecular Weight:	34.3
Stack Gas Static Pressure (in. Hg):	29.07
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	0.3
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	0.3
Maximum Exhaust Gas Flowrate (acfm):	84.5
Maximum Exhaust Gas Flowrate (scfm):	81.5
Average Acetaldehyde Emission Rate (lbs/hr):	0.00
Average Vinyl Acetate Emission Rate (lbs/hr):	0.32
Average Ethanol Emission Rate (lbs/hr):	0.05
Average Ethyl Acetate Emission Rate (lbs/hr):	0.00
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.30
Maximum Vinyl Acetate Emission Rate (lbs/hr):	32.40
Maximum Ethanol Emission Rate (lbs/hr):	6.14
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.19

TABLE 28
PK3, R3 CONDENSER OUTLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#3
Sampling Location:	Condenser Outlet
Test Run No.	3
Pressure Transmitter ID:	PT#6
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.07
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	1.12
Exhaust Gas Acetaldehyde Content (%):	0.10
Exhaust Gas Vinyl Acetate Content (%):	2.43
Exhaust Gas Ethanol Content (%):	0.47
Exhaust Gas Ethyl Acetate Content (%):	0.04
Exhaust Gas Moisture Content (%):	1.13
FTIR Response Time (s)	23
Sample Run Start Time:	9:19:00
Sample Run End Time:	18:22:00
Test Run Results	
Sampling Location Area (ft2):	0.06
Average Velocity Pressure (in. H2O):	-0.001
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.065
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2}):	0.003
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2}):	0.255
Exhaust Gas Molecular Weight:	30.4
Stack Gas Static Pressure (in. Hg):	29.07
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	0.5
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	0.5
Maximum Exhaust Gas Flowrate (acfm):	49.6
Maximum Exhaust Gas Flowrate (scfm):	47.3
Average Acetaldehyde Emission Rate (lbs/hr):	0.00
Average Vinyl Acetate Emission Rate (lbs/hr):	0.21
Average Ethanol Emission Rate (lbs/hr):	0.02
Average Ethyl Acetate Emission Rate (lbs/hr):	0.00
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.83
Maximum Vinyl Acetate Emission Rate (lbs/hr):	16.81
Maximum Ethanol Emission Rate (lbs/hr):	2.16
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.64

TABLE 29
PK3, R3 SCRUBBER OUTLET TEST RESULTS SUMMARY
ALCOHOL SOLUTION
SOLUTIA INC.
TRENTON, MICHIGAN

Test Run Input Information	
Process ID:	PK#3
Sampling Location:	Scrubber Outlet
Test Run No.	3
Pressure Transmitter ID:	PT#4
Sampling Location Diameter (in.):	3.26
Data Interval (s):	1
Transmitter Scale (0 to X in. H2O):	1
Pitot Tube Coefficient:	0.84
Barometric Pressure ("Hg):	29.07
Stack Static Pressure (in. H2O):	0
Exhaust Gas O2 Content (%):	20.9
Exhaust Gas CO2 Content (%):	0.26
Exhaust Gas Acetaldehyde Content (%):	0.00
Exhaust Gas Vinyl Acetate Content (%):	0.00
Exhaust Gas Ethanol Content (%):	0.00
Exhaust Gas Ethyl Acetate Content (%):	0.00
Exhaust Gas Moisture Content (%):	1.91
FTIR Response Time (s)	23
Sample Run Start Time:	9:19:00
Sample Run End Time:	18:22:00
Test Run Results	
Sampling Location Area (ft ²):	0.06
Average Velocity Pressure (in. H2O):	-0.002
Average Velocity Pressure with Negative Data Scrubbed (in. H2O):	0.000
Maximum Velocity Pressure (in. H2O):	0.056
Average Sq. Rt. Velocity Pressure with Data Scrubbed (in. H2O ^{1/2})	0.001
Maximum Sq. Rt. Velocity Pressure (in. H2O ^{1/2})	0.237
Exhaust Gas Molecular Weight:	28.7
Stack Gas Static Pressure (in. Hg):	29.07
Average Exhaust Gas Flowrate with Data Scrubbed (acfm):	0.3
Average Exhaust Gas Flowrate with Data Scrubbed (scfm):	0.3
Maximum Exhaust Gas Flowrate (acfm):	47.3
Maximum Exhaust Gas Flowrate (scfm):	45.5
Average Acetaldehyde Emission Rate (lbs/hr):	0.00000
Average Vinyl Acetate Emission Rate (lbs/hr):	0.00436
Average Ethanol Emission Rate (lbs/hr):	0.00000
Average Ethyl Acetate Emission Rate (lbs/hr):	0.00012
Maximum Acetaldehyde Emission Rate (lbs/hr):	0.00019
Maximum Vinyl Acetate Emission Rate (lbs/hr):	1.80940
Maximum Ethanol Emission Rate (lbs/hr):	0.00162
Maximum Ethyl Acetate Emission Rate (lbs/hr):	0.04060

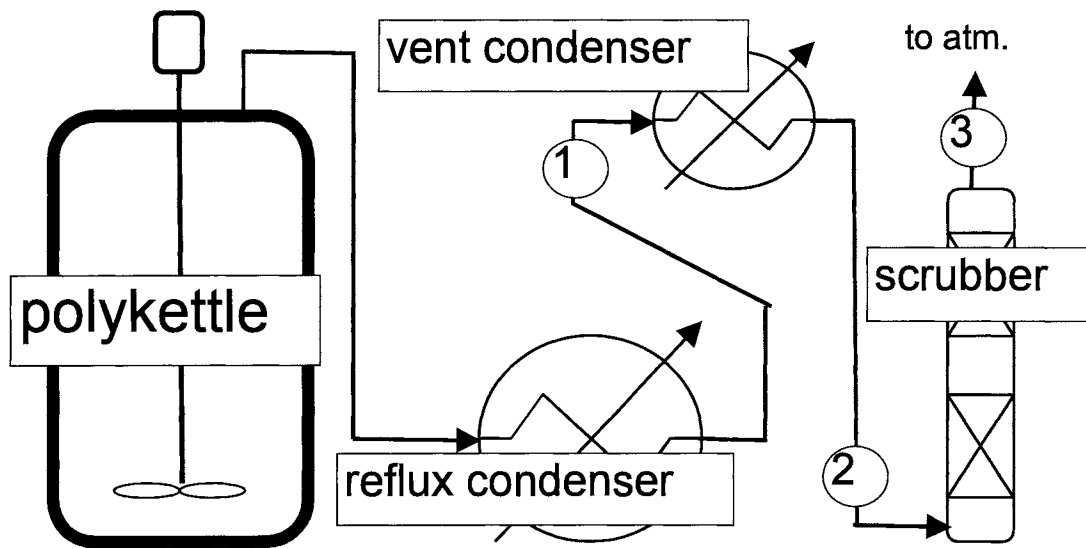


Figure 1

**Polykettle Reactors 1, 2, and 3
Vent Emissions Control System
Sampling Location Diagram**

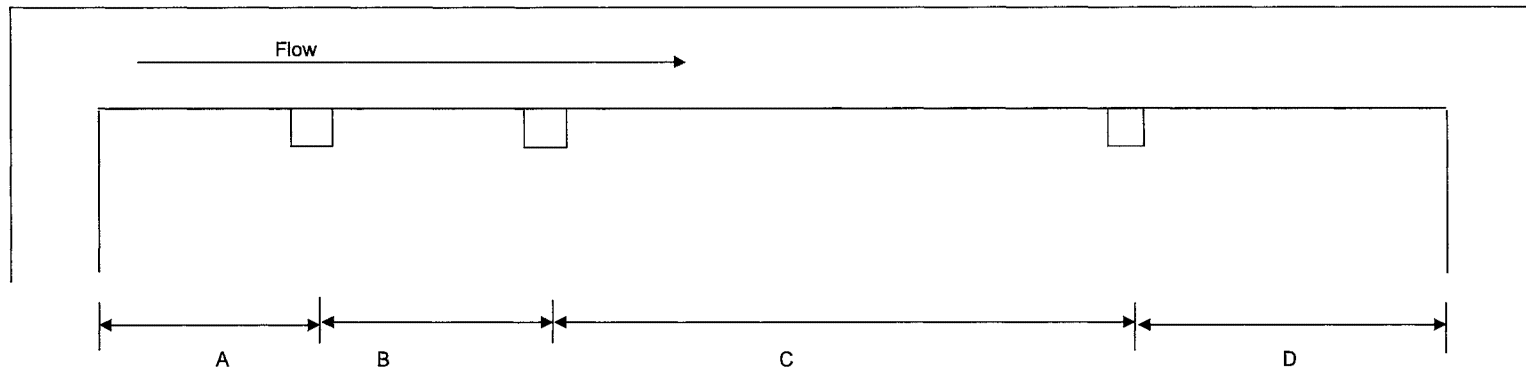
**Sampling Start Date:
April 30, 2018**

**BT Environmental Consulting
Inc.
4949 Fernlee Avenue
Royal Oak MI 48073**



Not to Scale

Pipe Diameter: 3.26 in



Item	Port Distance (in.)	Port Function
A	9	FTIR Withdrawal
B	19	FTIR Return
C	10	Pitot Tube
D	18	N/A

*Drawing does not necessarily reflect true pipe orientation

Figure 2

Site:
PK#1 Vent Condenser Inlet Sampling Ports
Solutia, Inc.
Trenton, Michigan

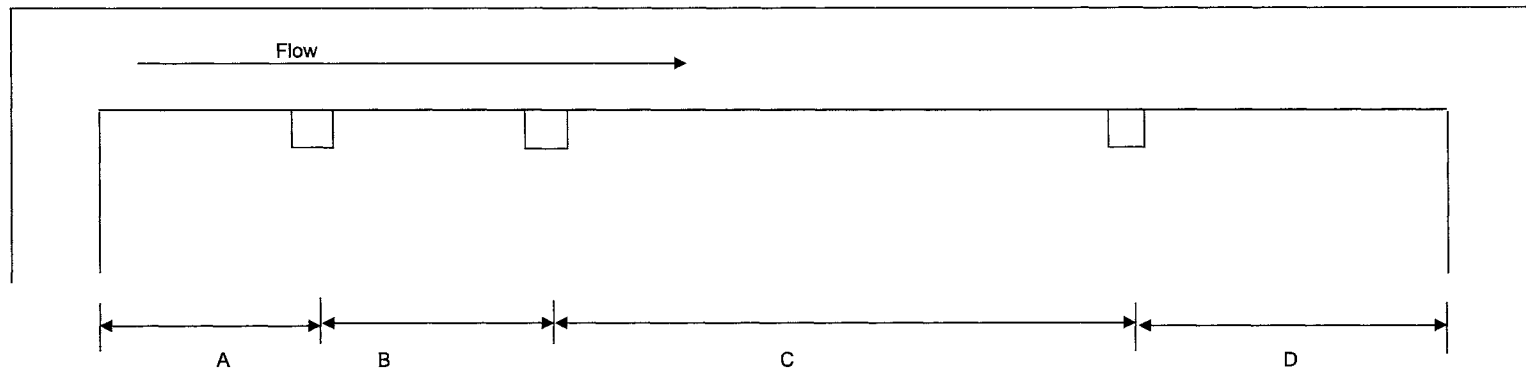
Sampling Start Date:
April 30, 2018

BT Environmental Consulting
Inc.
4949 Fernlee Avenue
Royal Oak MI 48073



Not to Scale

Pipe Diameter: 3.26 in



Item	Port Distance (in.)	Port Function
A	17	FTIR Withdrawal
B	10	FTIR Return
C	30	Pitot Tube
D	39	N/A

Figure 3

Site:
PK#1 Vent Condenser Outlet Sampling Ports
Solutia, Inc.
Trenton, Michigan

Sampling Start Date:
April 30, 2018

BT Environmental Consulting
Inc.
4949 Fernlee Avenue
Royal Oak MI 48073



Pipe Diameter: 3.26 in

Item	Port Distance (in.)	Port Function
A	9	Pitot Tube
B	12	FTIR Withdrawal
C	22	N/A

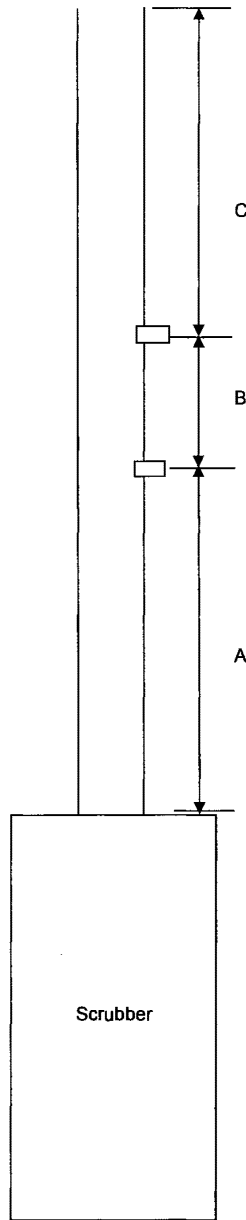


Figure 4

Site:
PK#1 Water Scrubber Sampling Ports
Solutia, Inc.
Trenton, Michigan

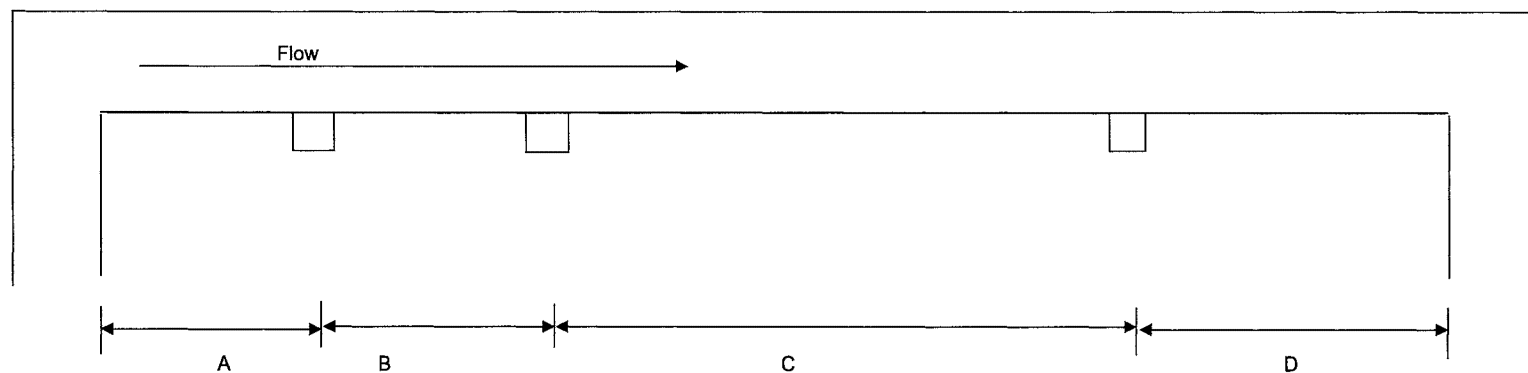
Sampling Start Date:
April 30, 2018

**BT Environmental Consulting
Inc.**
4949 Fernlee Avenue
Royal Oak MI 48073



Not to Scale

Pipe Diameter: 3.26 in



Item	Port Distance (in.)	Port Function
A	16	FTIR Withdrawal
B	10	FTIR Return
C	30	Pitot Tube
D	38	N/A

*Drawing does not necessarily reflect true pipe orientation

Figure 5

Site:
PK#2 Vent Condenser Inlet Sampling Ports
Solutia, Inc.
Trenton, Michigan

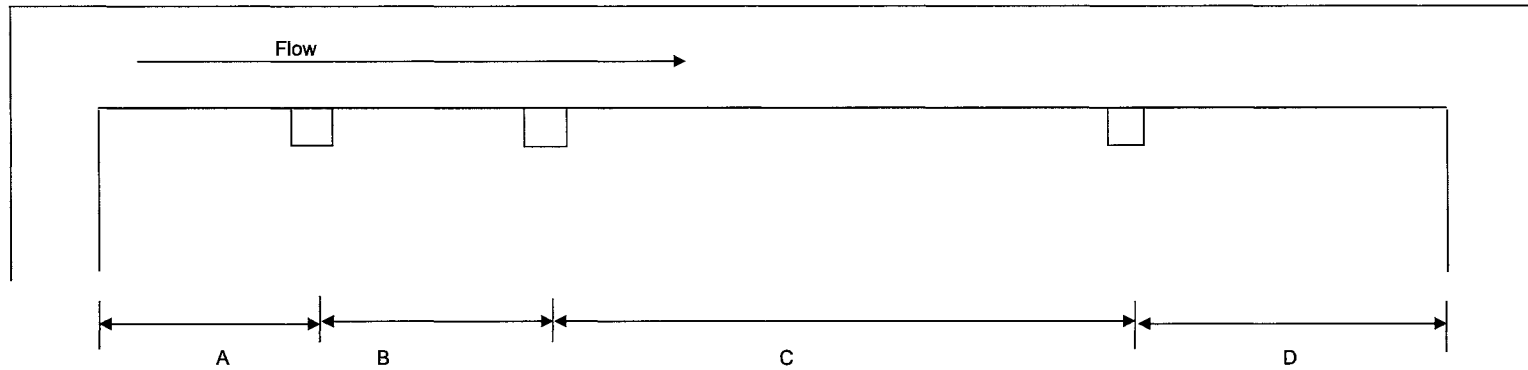
Sampling Start Date:
April 30, 2018

BT Environmental Consulting
Inc.
4949 Fernlee Avenue
Royal Oak MI 48073



Not to Scale

Pipe Diameter: 3.26 in



Item	Port Distance (in.)	Port Function
A	16	FTIR Withdrawal
B	10	FTIR Return
C	30	Pitot Tube
D	38	N/A

Figure 6

Site:
PK#2 Vent Condenser Outlet Sampling Ports
Solutia, Inc.
Trenton, Michigan

Sampling Start Date:
April 30, 2018

BT Environmental Consulting
Inc.
4949 Fernlee Avenue
Royal Oak MI 48073



Pipe Diameter: 3.26 in

Item	Port Distance (in.)	Port Function
A	9	Pitot Tube
B	12	FTIR Withdrawal
C	22	N/A

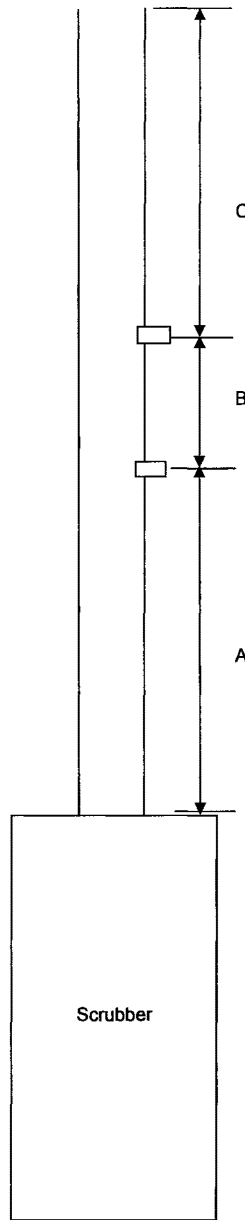


Figure 7

Site:
PK#2 Water Scrubber Sampling Ports
Solutia, Inc.
Trenton, Michigan

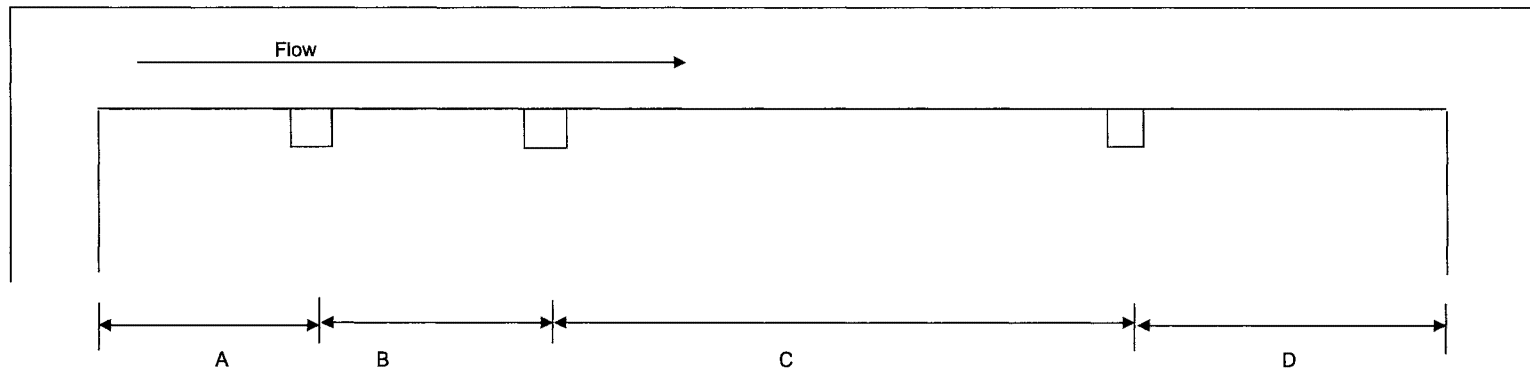
Sampling Start Date:
April 30, 2018

BT Environmental Consulting
Inc.
4949 Fernlee Avenue
Royal Oak MI 48073



Not to Scale

Pipe Diameter: 3.26 in



Item	Port Distance (in.)	Port Function
A	8	FTIR Withdrawal
B	19	FTIR Return
C	10	Pitot Tube
D	18	N/A

*Drawing does not necessarily reflect true pipe orientation

Figure 8

Site:
PK#3 Vent Condenser Inlet Sampling Ports
Solutia, Inc.
Trenton, Michigan

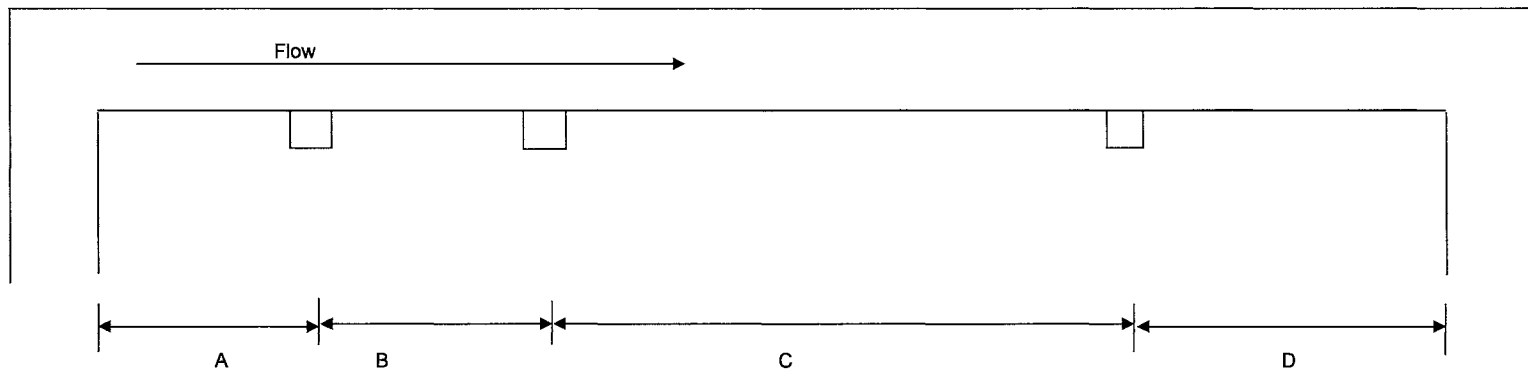
Sampling Start Date:
April 30, 2018

BT Environmental Consulting
Inc.
4949 Fernlee Avenue
Royal Oak MI 48073



Not to Scale

Pipe Diameter: 3.26 in



Item	Port Distance (in.)	Port Function
A	16	FTIR Withdrawal
B	10	FTIR Return
C	30	Pitot Tube
D	22	N/A

*Drawing does not necessarily reflect true pipe orientation

Figure 9

Site:
PK#3 Vent Condenser Outlet Sampling Ports
Solutia, Inc.
Trenton, Michigan

Sampling Start Date:
April 30, 2018

BT Environmental Consulting
Inc.
4949 Fernlee Avenue
Royal Oak MI 48073



Pipe Diameter: 3.26 in

Item	Port Distance (in.)	Port Function
A	9	Pitot Tube
B	12	FTIR Withdrawal
C	22	N/A

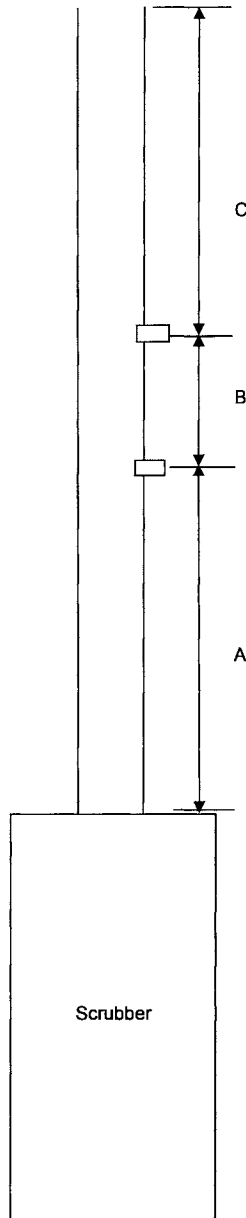


Figure 10

Site:
PK#3 Water Scrubber Sampling Ports
Solutia, Inc.
Trenton, Michigan

Sampling Start Date:
April 30, 2018

**BT Environmental Consulting
Inc.**
4949 Fernlee Avenue
Royal Oak MI 48073