



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

AUG 15 2018

SENT VIA EMAIL AND CERTIFIED MAIL

Madeleine Kadas
Beveridge & Diamond, PC
98 San Jacinto Blvd.
Ste. 1420
Austin, TX 78701

Email: MKadas@bdlaw.com

RE: In the Matter of BASF Corp.
Consent Agreement and Final Order, Docket No. CAA-06-2018-3313
Administrative Compliance Order on Consent, Docket No. CAA-06-2018-3314

Ms. Kadas,

Please find enclosed a copy of the fully-executed Consent Agreement and Final Order ("CAFO"), Docket No. CAA-06-2018-3313, that was filed with the Regional Hearing Clerk in EPA, Region 6, and a copy of the fully-executed Administrative Compliance Order on Consent ("ACO"), Docket No. CAA-06-2018-3314. BASF will have thirty (30) days from the effective date of the CAFO to pay the civil penalty of One Hundred Thirty Thousand, Two Hundred Fifty Dollars (\$130,250).

Please note the timeframes listed in the CAFO and ACO for compliance with the terms of each document.

If you have any questions, please contact Erin Tanimura by phone at 214-665-8181 or by email at Tanimura.Erin@epa.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Cheryl T. Seager".

Cheryl T. Seager
Director
Compliance Assurance and
Enforcement Division

Enclosures

BASF Corporation
CAFO & ACO

cc:

Tom Yura
Sr. Vice President and General Manager
BASF Corporation
P.O. Box 457
Geismar, LA 70734-0457

ecc:

Linda Mirsky Brenneman (linda.brenneman@basf.com)
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UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION 6
DALLAS, TEXAS

FILED
2018 AUG 16 PM 2:55
REGIONAL HEARING CLERK
EPA REGION VI

IN THE MATTER OF:

BASF CORPORATION
GEISMAR, LOUISIANA, 70734

RESPONDENT.

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DOCKET NO. CAA-06-2018-3313

CONSENT AGREEMENT

A. PRELIMINARY STATEMENT

1. This is an administrative penalty assessment proceeding brought under Section 113(d) of the Clean Air Act, (the "CAA" or "Act"), 42 U.S.C. § 7413(d), and Sections 22.13, 22.18, and 22.34 of the Consolidated Rules of Practice Governing the Administrative Assessment of Civil Penalties and the Revocation/Termination or Suspension of Permit ("Consolidated Rules"), as codified at 40 C.F.R. Part 22.

2. Complainant is the United States Environmental Protection Agency, Region 6 (the "EPA"). On the EPA's behalf, the Director of the Compliance Assurance and Enforcement Division has been delegated the authority to settle civil administrative penalty proceedings under Section 113(d) of the Act.

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3. Respondent, BASF Corporation, is a corporation doing business in the state of Louisiana. Respondent is a “person” as defined in Section 302(e) of the Act, 42 U.S.C. § 7602(e).

4. For the purposes of this Consent Agreement and corresponding Final Order (together, the “CAFO”), Complainant and Respondent shall be referred to collectively as the “Parties.”

5. On October 9, 2014, EPA issued an information request regarding the Facility under Section 114 of the Act, 42 U.S.C. § 7414 (“Section 114 Request”). BASF timely submitted its response on January 30, 2015, and supplemented its response on March 11, 2016. As part of its response, BASF provided responsive information regarding the Facility’s flaring operations, including but not limited to vent gas and assist steam flow rates, Steam-to-Vent Gas ratio, and vent gas net heating value.

6. As described more fully herein, Complainant alleges that Respondent violated 40 C.F.R. §§ 60.11(d), 63.6(e), and/or 63.11(b)(6)(ii) at the following flares, collectively referred to as the “Flares,” located at 8404 River Road, Geismar, Louisiana 70734 (the “Facility”), at various times from July 1, 2011, to October 15, 2014:

- a. EO/EG Flare/“Flare 10,” a steam-assisted flare;
- b. Polyol Flare/“Flare 13,” a non-assisted flare;
- c. TDI Flare/“Flare 14,” a steam-assisted flare.

7. The Parties, having agreed that settlement of this action is in the public interest, consent to the entry of this CAFO without adjudication of any issues of law or fact herein, and Respondent agrees to comply with the terms of this CAFO.

8. Respondent has cooperated with EPA and taken proactive measures to improve flare destruction and removal efficiencies and monitoring capabilities since the issuance of the Section 114 Request. Respondent initiated projects in the EO Plant, TDI Plant, Polyol Plant, and MDI-2

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Plant that include: installation of ultrasonic flow meters, steam flow meters, and a vent scrubber. In addition, the Respondent has developed and initiated flare operations training for all new hire plant operators and periodic flare operations training for operations personnel that are responsible for operating the flares.

B. JURISDICTION

9. This CAFO is entered into under Section 113(d) of the Act, as amended, 42 U.S.C. § 7413(d), and the Consolidated Rules, 40 C.F.R. Part 22. The alleged violations in this CAFO are pursuant to Section 113(a)(3)(A).

10. The EPA and the United States Department of Justice jointly determined that this matter, although it involves alleged violations that occurred more than a year before the initiation of this proceeding, is appropriate for an administrative penalty assessment. 42 U.S.C. § 7413(d); 40 C.F.R. § 19.4.

11. The Regional Judicial Officer is authorized to ratify this CAFO which memorializes a settlement between the Parties. 40 C.F.R. §§ 22.4(b) and 22.18(b).

12. The issuance of this CAFO simultaneously commences and concludes this proceeding. 40 C.F.R. § 22.13(b).

C. DEFINITIONS

13. "Ambient Air" shall mean that portion of the atmosphere, external to buildings, to which persons have access.

14. "Assist Air" shall mean all air that intentionally is introduced prior to or at a flare tip through nozzles or other hardware conveyances for the purposes including, but not limited to, protecting the design of the flare tip, promoting turbulence for mixing or inducing air into the

flame. Assist Air includes Premix Assist Air and Perimeter Assist Air. Assist Air does not include Ambient Air.

15. “Assist Steam” shall mean steam that intentionally is introduced prior to or at a flare tip through nozzles or other hardware conveyance for the purposes including, but not limited to, protecting the design of the flare tip, promoting turbulence for mixing, or inducing air into the flame. Assist Steam includes, but is not necessarily limited to, Center Steam, Lower Steam, and Upper Steam.

16. “BTU/scf” shall mean British Thermal Unit per standard cubic foot.

17. “Center Steam” shall mean the portion of Assist Steam introduced into the stack of the flare to reduce burnback.

18. “Combustion Zone” shall mean the area of the flare flame where the Combustion Zone Gas combines for combustion.

19. “Combustion Zone Gas” shall mean all gases and vapors found after the flare tip. This gas includes all Vent Gas, Pilot Gas, Total Steam, and Premix Assist Air.

20. “In Operation” or “Being In Operation” or “Operating,” with respect to a flare, shall mean any and all times that Sweep, Supplemental, and/or Waste Gas is or may be vented to the flare. A flare that is In Operation is capable of receiving Sweep, Supplemental, and/or Waste Gas unless all Sweep, Supplemental, and Waste Gas flow is prevented by means of closed valves and/or blinds.

21. “Lower Heating Value” or “LHV” shall mean the theoretical total quantity of heat liberated by the complete combustion of a unit volume or weight of a fuel initially at 25 degrees Centigrade and 760 mmHG, assuming that the produced water is vaporized and all combustion

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products remain at, or are returned to, 25 degrees Centigrade; however, the standard for determining the volume corresponding to one mole is 20 degrees Centigrade.

22. "Lower Steam" shall mean the portion of Assist Steam piped to an exterior annular ring near the lower part of a flare tip, which then flows through tubes to the flare tip, and ultimately exits the tubes at the flare tip.

23. "Malfunction" shall mean, as specified in 40 C.F.R. § 60.2, "any sudden, infrequent, and not reasonably preventable failure of air pollution control equipment, process equipment, or a process to operate in a normal or usual manner. Failures that are caused in part by poor maintenance or careless operation are not malfunctions." In any dispute under this CAFO involving this definition, Respondent shall have the burden of proving all of the following:

- a. The excess emissions were caused by a sudden, unavoidable breakdown of technology, beyond the control of the owner or operator;
- b. The excess emissions (1) did not stem from any activity or event that could have been foreseen and avoided, or planned for, and (2) could not have been avoided by better operation and maintenance practices;
- c. To the maximum extent practicable the air pollution control equipment or processes were maintained and operated in a manner consistent with good practice for minimizing emissions;
- d. Repairs were made in an expeditious fashion when the operator knew or should have known that applicable emission limitations were being exceeded. Off-shift labor and overtime must have been utilized, to the extent practicable, to ensure that such repairs were made as expeditiously as practicable;

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- e. The amount and duration of the excess emissions (including any bypass) were minimized to the maximum extent practicable during periods of such emissions;
- f. All possible steps were taken to minimize the impact of the excess emissions on ambient air quality;
- g. All emission monitoring systems were kept in operation if at all possible;
- h. The owner or operator's actions during the period of excess emissions were documented by properly signed, contemporaneous operating logs, or other relevant evidence;
- i. The excess emissions were not part of a recurring pattern indicative of inadequate design, operation, or maintenance; and
- j. The owner or operator properly and promptly notified the appropriate regulatory authority.

24. "Monitoring System Malfunction" shall mean any sudden, infrequent, and not reasonably preventable failure of instrumentation or a monitoring system to operate in a normal or usual manner. Failures that are caused in part by poor maintenance or careless operation are not Monitoring System Malfunctions. In any dispute under this CAFO involving this definition, Respondent shall have the burden of proving all of the following:

- a. The instrument or monitoring system downtime was caused by a sudden, unavoidable breakdown of technology, beyond the control of the owner or operator;
- b. The instrument or monitoring system downtime (1) did not stem from any activity or event that could have been foreseen and avoided, or planned for, and (2) could not have been avoided by better operation and maintenance practices;

- c. To the maximum extent practicable the air pollution control equipment or processes were maintained and operated in a manner consistent with good practice for minimizing emissions;
 - d. Repairs were made in an expeditious fashion when the operator knew or should have known that applicable emission limitations were being exceeded. Off-shift labor and overtime must have been utilized, to the extent practicable, to ensure that such repairs were made as expeditiously as practicable;
 - e. The amount and duration of the instrument or monitoring system downtime was minimized to the maximum extent practicable;
 - f. The owner or operator's actions during the period of instrument or monitoring system downtime were documented by properly signed, contemporaneous operating logs, or other relevant evidence; and
 - g. The instrument or monitoring system downtime was not part of a recurring pattern indicative of inadequate design, operation, or maintenance.
25. "Net Heating Value" shall mean the Lower Heating Value.
26. "Net Heating Value of Combustion Zone Gas" or " NHV_{CZ} " shall mean the Lower Heating Value, in BTU/scf, of the Combustion Zone Gas in a flare. The NHV_{CZ} shall be calculated in accordance with Step 3 of Appendix D of this CAFO.
27. "Net Heating Value of Vent Gas" or NHV_{VG} shall mean the Lower Heating Value, in BTU/scf, of the Vent Gas directed to a flare. NHV_{VG} shall be calculated in accordance with Step 1 of Appendix D of this CAFO.

28. “New source” is defined as any stationary source, the construction or modification of which is commenced after the publication of the NSPS regulations or proposed NSPS regulations applicable to such sources. 42 U.S.C. § 7411(a)(2).

29. “Perimeter Assist Air” shall mean the portion of Assist Air introduced at the perimeter of the flare tip or above the flare tip. Perimeter Assist Air includes air intentionally entrained in lower and upper steam. Perimeter Assist Air includes all Assist Air except Premix Assist Air.

30. “Pilot Gas” shall mean gas introduced into a flare tip that provides a flame to ignite the Vent Gas.

31. “Premix Assist Air” shall mean the portion of Assist Air that is introduced to the Vent Gas, whether injected or induced, prior to the flare tip. Premix Assist Air also includes any air intentionally entrained in Center Steam.

32. “Purge Gas” shall mean the minimum amount of gas introduced between the flare water seal and the flare tip to prevent oxygen infiltration (backflow) into the flare tip.

33. “Stationary Source” is defined as a building, structure, facility, or installation which emits or may emit any air pollutant. 42 U.S.C. §§ 7411(a)(3), 7412(a)(3).

34. “Steam-Assisted Flare” shall mean a flare that utilizes steam piped to a flare tip to assist in combustion.

35. “Supplemental Gas” shall mean all gas introduced to a flare in order to improve the combustible characteristics of the Combustion Zone Gas.

36. “Sweep Gas” shall mean the minimum amount of gas introduced into a flare header to (a) prevent oxygen buildup, corrosion, and/or freezing in the header; (b) maintain a safe flow of

gas through the header; including a higher flow during hot taps; and (c) prevent oxygen infiltration (backflow) into the flare tip.

37. “Total Steam” shall mean the total of all steam that is supplied to a flare and includes, but is not limited to, Lower Steam, Center Steam, and Upper Steam.

38. “Upper Steam” shall mean the portion of Assist Steam introduced via nozzles located on the exterior perimeter of the upper end of a flare tip.

39. “Vent Gas” shall mean all gas found just prior to the flare tip. This gas includes all Waste Gas (i.e., gas from facility operations that is directed to the Flare for the purpose of disposing of the gas), that portion of Sweep Gas that is not recovered, Purge Gas, and Supplemental Gas, but it does not include Pilot Gas, Total Steam, or Assist Air.

40. “Waste Gas” shall mean the mixture of all gases from the facility operations that is directed to a flare for the purpose of disposing of the gas. “Waste Gas” does not include gas introduced to the flare exclusively to make it operate safely and as intended; therefore “Waste Gas” does not include Pilot Gas, Total Steam, Assist Air, or the minimum amount of Sweep Gas and Purge Gas that is necessary to perform the functions of Sweep Gas and Purge Gas. “Waste Gas” also does not include the minimum amount of gas introduced to a flare to comply with regulatory and/or enforceable permit requirements regarding the combustible characteristics of Combustion Zone Gas; therefore “Waste Gas” does not include Supplemental Gas.

D. GOVERNING LAW

National Emission Standards for Hazardous Air Pollutants

41. Section 112 of the CAA, 42 U.S.C. § 7412, sets forth a national program for the control of hazardous air pollutants (“HAPs”). Under Section 112(b), Congress listed 188 HAPs believed to cause adverse health or environmental effects. 42 U.S.C. § 7412(b)(1).

42. Congress directed EPA to publish a list of all categories and subcategories of, *inter alia*, major sources of HAPs. CAA § 112(c); 42 U.S.C. § 7412(c).

43. Congress directed EPA to promulgate regulations establishing emission standards for each category or subcategory of, *inter alia*, major sources of HAPs. CAA § 112(d)(1); 42 U.S.C. § 7412(d)(1). These emission standards must require the maximum degree of reduction in emissions of HAPs that the Administrator, taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impacts and energy requirements, determines is achievable for the new or existing sources in the category or subcategory to which the emission standard applies. CAA § 112(d)(2); 42 U.S.C. § 7412(d)(2).

44. To the extent that it is not feasible to prescribe or enforce an emission standard for the control of a HAP, Congress authorized EPA to promulgate “design, equipment, work practice, or operational” standards, which are to be treated as emission standards. CAA § 112(h); 42 U.S.C. § 7412(h).

45. The emission standards promulgated under Section 112 of the 1990 Amendments of the CAA, 42 U.S.C. § 7412, are known as the National Emission Standards for Hazardous Air Pollutants (“NESHAPs”) for Source Categories or “MACT” (“maximum achievable control technology”) standards. These emission standards are found in Part 63 of Title 40 of the Code of Federal Regulations.

46. After the effective date of any emission standard, limitation, or regulation promulgated pursuant to Section 112 of the CAA, no person may operate a source in violation of such standard, limitation, or regulation. 42 U.S.C. § 7412(i)(3).

47. Pursuant to Section 112 of the CAA, 42 U.S.C. § 7412, EPA has promulgated regulations that contain general provisions applicable to sources that are subject to the MACT standards. 40 C.F.R. Part 63, Subpart A, §§ 63.1–63.16 (“NESHAPs Subpart A”).

48. NESHAPs Subpart A requires that “[a]t all times, including periods of startup, shutdown, and malfunction, the owner or operator must operate and maintain any affected source, including associated air pollution control equipment and monitoring equipment, in a manner consistent with safety and good air pollution control practices for minimizing emissions.” 40 C.F.R. § 63.6(e).

49. NESHAPs Subpart A also requires that “[f]lares shall be used only with the net heating value of the gas being combusted at 11.2 MJ/scm (300 Btu/scf) or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted at 7.45 [MJ/scm] (200 Btu/scf) or greater if the flare[] is non-assisted.” 40 C.F.R. § 63.11(b)(6)(ii).

New Source Performance Standards

50. Section 111(b)(1)(A) of the CAA, 42 U.S.C. § 7411(b)(1)(A), requires EPA to publish and periodically revise a list of categories of stationary sources including those categories that, in EPA’s judgment, cause or contribute significantly to air pollution which may reasonably be anticipated to endanger public health or welfare.

51. Once a category is included on the list, Section 111(b)(1)(B) of the CAA, 42 U.S.C. § 7411(b)(1)(B), requires EPA to promulgate a federal standard of performance for new sources within the category, also known as a New Source Performance Standard (“NSPS”). Section 111(e) of the CAA, 42 U.S.C. § 7411(e), prohibits an owner or operator of a new source from operating that source in violation of an NSPS after the effective date of the NSPS applicable to such source.

52. The NSPS are located in Part 60 of Title 40 of the Code of Federal Regulations.

53. Pursuant to Section 111(b)(1)(B) of the CAA, 42 U.S.C. § 7411(b)(1)(B), EPA has promulgated regulations that contain general provision applicable to all NSPS sources. 40 C.F.R. Part 60, Subpart A, §§ 60.1–60.19 (“NSPS Subpart A”).

54. Under NSPS Subpart A, the provisions of 40 C.F.R. Part 60 “apply to the owner or operator of any stationary source which contains an affected facility, the construction or modification of which is commenced after publication [in Part 60] of any standard (or, if earlier, the date of publication of any proposed standard) applicable to that facility.” 40 C.F.R. § 60.1(a).

55. NSPS Subpart A requires that “[a]t all times, including periods of startup, shutdown, and malfunction, owners and operators shall, to the extent practicable, maintain and operate any affected facility including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions.” 40 C.F.R. § 60.11(d).

E. FINDINGS OF FACT AND CONCLUSIONS OF LAW

56. At all times relevant to this proceeding, Respondent has owned and/or operated the Facility.

57. Respondent is the owner and/or operator of the Facility within the meaning of Sections 111(a)(5) and 112(a)(9) of the Act, 42 U.S.C. §§ 7411(a)(5) and 7412(a)(9), and 40 C.F.R. §§ 60.2 and 63.2.

58. At all times relevant to this proceeding, Respondent owned and/or operated units that emit benzene, carbon tetrachloride, chlorobenzene, chloroform, ethylene glycol, ethylene oxide, hexane, methanol, propylene oxide, toluene, and toluidine at the Facility.

59. The Facility produces over 20 chemicals, including basic and specialty chemicals, intermediates, and polyurethanes.

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60. The Facility is a “stationary source” as that term is defined in Sections 111(a)(3) and 112(a)(3) of the Act, 42 U.S.C. §§ 7411(a)(3) and 7412(a)(3), and 40 C.F.R. §§ 60.2 and 63.2.

61. At all times relevant to this proceeding, the Facility was a “major source” within the meaning of the Act’s Title V program, Section 501(2) of the Act, 42 U.S.C. § 7661(2), 40 C.F.R. § 70.2, and 33 LA. ADMIN. CODE § 502.

62. The Facility is subject to the CAA Title V Federal Operating Permit program.

63. On or about January 18, 2013, the Louisiana Department of Environmental Quality (“LDEQ”) issued Respondent Permit No. 2459-V5, an air permit issued under the Louisiana Operating Permit Program, approved by EPA at 60 Fed. Reg. 47,296 (Sept. 12, 1995). Permit No. 2459-V5 covers various emissions units at the Facility, including the EO/EG Flare.

64. At the Facility, Respondent utilizes the EO/EG Flare to control the emission of Waste Gas from Respondent’s Ethylene Oxide (“EO”) / Ethylene Glycol (“EG”) Plant. Permit No. 2459-V5 requires, *inter alia*, that Respondent operate the EO/EG Flare in compliance with certain provisions of NESHAPs Subpart A.

65. On or about November 15, 2012, LDEQ issued Respondent Permit No. 2427-V3, an air permit issued under the Louisiana Operating Permit Program. Permit No. 2427-V3 covers various emissions units at the Facility, including the Polyol Flare.

66. At the Facility, Respondent utilizes the Polyol Flare to control the emission of Waste Gas from Respondent’s Polyol Plant. Permit No. 2427-V3 requires, *inter alia*, that Respondent operate the Polyol Flare in compliance with certain provisions of NESHAPs Subpart A.

67. On or about April 23, 2013, LDEQ issued Respondent Permit No. 2643-V3, an air permit issued under the Louisiana Operating Permit Program. Permit No. 2643-V3 covers various emissions units at the Facility, including the TDI Flare.

68. At the Facility, Respondent utilizes the TDI Flare to control the emission of Waste Gas from Respondent's Toluene Diisocyanate ("TDI") Plant. Permit No. 2643-V3 requires, *inter alia*, that Respondent operate TDI Flare in compliance with certain provisions of NSPS Subpart A and NESHAPs Subpart A.

69. On October 9, 2014, EPA issued the Section 114 Request. BASF timely submitted its response on January 30, 2015, and supplemented its response on March 11, 2016. As part of its response, BASF provided responsive information regarding the Facility's flaring operations, including but not limited to vent gas and assist steam flow rates, Steam-to-Vent Gas ratio, and vent gas net heating value.

70. Based on its review of the information submitted in response to the Section 114 Request and other disclosures made by BASF, EPA identified alleged violations of the CAA at the EO/EG Flare, Polyol Flare, and TDI Flare (collectively, "the Flares"), as described in Section F of this CAFO.

F. ALLEGED VIOLATIONS

Failure to Operate the Flares with the Requisite Minimum Net Heating Value of the Gas Being Combusted

71. The Flares are each subject to 40 C.F.R. § 63.11(b)(6)(ii), under which Respondent was and is required to operate steam-assisted flares with the NHV of the gas being combusted at 300 Btu/scf or greater, and under which Respondent was and is required to operate non-assisted flares with the NHV of the gas being combusted at 200 Btu/scf or greater.

72. On information and belief, at various times from July 1, 2011, to October 15, 2014, as reflected in the data Respondent produced to EPA described in Section E:

- a. Respondent operated the EO/EG Flare, which is steam-assisted, with the Vent Gas being combusted having an NHV of less than 300 BTU/scf;

- b. Respondent operated the Polyol Flare, which has operated as both steam-assisted and non-assisted, with the Vent Gas being combusted having an NHV of less than 200 BTU/scf when operated as non-assisted; and
- c. Respondent operated the TDI Flare, which has operated as both steam-assisted and non-assisted, with the Vent Gas being combusted having an NHV below the requisite minimum.

Failure to Operate EO/EG Flare in a Manner Consistent with Good Air Pollution Control Practices for Minimizing Emissions

73. The EO/EG Flare is subject to 40 C.F.R. § 63.6(e). Under this regulation, Respondent was and is required, at all times, including periods of startup, shutdown, and malfunction, to maintain and operate the EO/EG Flare in a manner consistent with good air pollution control practice for minimizing emissions.

74. On information and belief, at various times from July 1, 2011, to October 15, 2014, as reflected in the data Respondent produced to EPA described in Section E, above, the EO/EG Flare was operated with an excessively high steam-to-Vent Gas ratio. Upon information and belief, this excessively high steam-to-Vent Gas ratio increased the likelihood of flame quenching and reduced combustion efficiency.

75. On information and belief, at various times from July 1, 2011, to October 15, 2014, as reflected in the data Respondent produced to EPA described in Section E, above, the EO/EG Flare was operated without a sufficient NHV_{CZ} . Upon information and belief, this insufficient NHV reduced flare combustion efficiency.

76. As referenced above, BASF's operation of the EO/EG Flare with high steam-to-Vent Gas ratios and with an insufficient NHV_{CZ} violated the requirement to operate the EO/EG Flare in

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a manner consistent with good air pollution control practices for minimizing emissions, as required by 40 C.F.R. § 63.6(e).

Failure to Operate TDI Flare in a Manner Consistent with Good Air Pollution Control Practices for Minimizing Emissions

77. The TDI Flare is subject to 40 C.F.R. § 60.11(d). Under this regulation, Respondent was and is required, at all times, including periods of startup, shutdown, and malfunction, to the extent practicable, to maintain and operate the TDI Flare in a manner consistent with good air pollution control practice for minimizing emissions.

78. On information and belief, at various times from July 1, 2011, to October 15, 2014, as reflected in the data Respondent produced to EPA described in Section E, above, the TDI Flare was operated with an excessively high steam-to-Vent Gas ratio. Upon information and belief, this excessively high steam-to-Vent Gas ratio increased the likelihood of flame quenching and reduced combustion efficiency.

79. On information and belief, at various times from July 1, 2011, to October 15, 2014, as reflected in the data Respondent produced to EPA described in Section E, above, the TDI Flare was operated without a sufficient NHV_{CZ} . Upon information and belief, this insufficient NHV reduced flare combustion efficiency.

80. As referenced above, BASF's operation of the TDI Flare high steam-to-Vent Gas ratios and with an insufficient NHV_{CZ} violated the requirement to operate the TDI Flare in a manner consistent with good air pollution control practices for minimizing emissions, as required by 40 C.F.R. § 60.11(d).

G. CIVIL PENALTY AND CONDITIONS OF SETTLEMENT

General

81. For the purpose of this proceeding, as required by 40 C.F.R. § 22.18(b)(2),

Respondent:

- a. admits that the EPA has jurisdiction over the subject matter alleged in this CAFO;
- b. neither admits nor denies the specific factual allegations contained in the CAFO;
- c. consents to the assessment of a civil penalty as stated below;
- d. consents to the issuance of any specified compliance or corrective action order¹;
- e. consents to the conditions specified in this CAFO;
- f. consents to any stated Permit Action²;
- g. waives any right to contest the alleged violations set forth in Section F of this CAFO; and
- h. waives its rights to appeal the Final Order included in this CAFO.

82. For the purpose of this proceeding, Respondent:

- a. agrees that this CAFO states a claim upon which relief may be granted against Respondent;
- b. acknowledges that this CAFO constitutes an enforcement action for purposes of considering Respondent's compliance history in any subsequent enforcement actions;

¹ 40 C.F.R. § 22.18(b)(2) requires that all of the items in Paragraph 75 be included in a CAFO. However, sub-bullets d. and f. are not applicable to this case.

² *See id.*

- c. waives any and all remedies, claims for relief and otherwise available rights to judicial or administrative review that Respondent may have with respect to any issue of fact or law set forth in this CAFO, including any right of judicial review under Section 307(b)(1) of the Act, 42 U.S.C. § 7607(b)(1);
- d. consents to personal jurisdiction in any action to enforce this CAFO in the United States District Court for the Middle District of Louisiana;
- e. waives any right it may possess at law or in equity to challenge the authority of the EPA to bring a civil action in a United States District Court to compel compliance with this CAFO and to seek an additional penalty for such noncompliance, and agrees that federal law shall govern in any such civil action; and
- f. agrees that in any subsequent administrative or judicial proceeding initiated by the Complainant or the United States for injunctive relief, civil penalties, or other relief relating to this Facility, Respondent shall not assert, and may not maintain, any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claim preclusion, claim splitting, or other defenses based on any contention that the claims raised by the Complainant or the United States were or should have been brought in the instant case, except with respect to claims that have been specifically resolved pursuant to this CAFO.

Penalty Assessment and Collection

83. Upon consideration of the entire record herein, including the Findings of Fact and Conclusions of Law, which are hereby adopted and made a part hereof, and upon consideration of

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the size of the business, the economic impact of the penalty on the business, the Respondent's full compliance history and good faith efforts to comply, the duration of the violation, payment by the Respondent of penalties previously assessed for the same violation, the economic benefit of noncompliance, the seriousness of the violation, and other factors as justice may require, EPA has assessed a civil penalty in the amount of One Hundred Thirty Thousand, Two Hundred Fifty Dollars (\$130,250) ("EPA Penalty"). The EPA Penalty has been determined in accordance with the Section 113 of the Act, 42, U.S.C. § 7413 and at no time exceeded EPA's statutory authority.

84. Respondent agrees to:

- a. pay the EPA Penalty within 30 calendar days of the Effective Date of this CAFO, and
- b. pay the EPA Penalty by cashier's check, certified check, or wire transfer made payable to "Treasurer, United States of America, EPA – Region 6." Payment shall be remitted in one of five (5) ways: (1) regular U.S. Postal Service mail including certified mail; (2) overnight mail; (3) wire transfer; (4) Automated Clearinghouse for receiving US currency; or (5) On Line Payment.

For regular U.S. Postal Service mail, U.S. Postal Service certified mail, or U.S. Postal Service express mail, payment should be remitted to:

U.S. Environmental Protection Agency
Fines and Penalties
Cincinnati Finance Center
PO Box 979077
St. Louis, MO 63197-9000

Re: BASF Corporation
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For overnight mail (non-U.S. Postal Service, e.g. FedEx), payment should be remitted to:

U.S. Bank
Government Lockbox 979077
U.S. EPA Fines & Penalties
1005 Convention Plaza
SL-MO-C2-GL
St. Louis, MO 63101

Contact: Natalie Pearson
(314) 418-4087

For wire transfer, payment should be remitted to:

Federal Reserve Bank of New York
ABA: 021030004
Account Number: 68010727
SWIFT address: FRNYUS33
33 Liberty Street
New York, NY 10045

Field Tag 4200 of the Fedwire message should read:
“D 68010727 Environmental Protection Agency”

For Automated Clearinghouse (also known as “remittance express” or “REX”):

U.S. Treasury REX / Cashlink ACH Receiver
ABA: 051036706
Account Number: 310006, Environmental Protection Agency
CTX Format Transaction Code 22 – checking
Physical location of U.S. Treasury facility:
5700 Rivertech Court
Riverdale, MD 20737

Contact: Jesse White
(301) 887-6548

For On Line Payment:

<https://www.pav.gov/pavgov/>
Enter sfo 1.1 in search field
Open form and complete required fields.

PLEASE NOTE: The docket number CAA-06-2018-3313 should be clearly typed on the check to ensure proper credit. The payment shall also be accompanied by a transmittal letter that shall reference BASF’s name and address, the case name, and

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docket number CAA-06-2018-3313. BASF's adherence to this request will ensure proper credit is given when penalties are received for the Region.

85. Respondent shall also send a simultaneous notice of such payment, including a copy of the money order, or check, and the transmittal letter to the following addresses:

Justin Chen (6EN-AT)
U.S. EPA Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

And

Region 6 Hearing Clerk (6RC-D)
U.S. EPA Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

86. Respondent agrees to pay the following on any overdue EPA Penalty:

- a. Interest. Pursuant to Section 113(d)(5) of the Act, 42 U.S.C. § 7413(d)(5), any unpaid portion of a civil penalty must bear interest at the rates established pursuant to 26 U.S.C. § 6621(a)(2).
- b. Nonpayment Penalty. On any portion of a civil penalty more than 90 calendar days delinquent, Respondent must pay a nonpayment penalty, pursuant to Section 113(d)(5) of the Act, 42 U.S.C. § 7413(d)(5), which shall accrue from the date the penalty payment became delinquent, and which shall be in addition to the interest which accrues under subparagraph a. of this paragraph.

87. Respondent shall pay a charge to cover the cost of processing and handling any delinquent penalty claim, pursuant to 42 U.S.C. § 7413(d)(5), including but not limited to attorneys' fees incurred by the United States for collection proceedings.

88. If Respondent fails to timely pay any portion of the penalty assessed under this CAFO, the EPA may:

- a. refer the debt to a credit reporting agency, a collection agency, or to the Department of Justice for filing of a collection action in the appropriate United States District Court (in which the validity, amount, and appropriateness of the assessed penalty and of this CAFO shall not be subject to review) to secure payment of the debt, which may include the original penalty, enforcement and collection expenses, nonpayment penalty and interest, 42 U.S.C. § 7413(d)(5) and 40 C.F.R. §§ 13.13, 13.14, and 13.33;
- b. collect the above-referenced debt by administrative offset (i.e., the withholding of money payable by the United States to, or held by the United States for, a person to satisfy the debt the person owes the Government), which includes, but is not limited to, referral to the Internal Revenue Service for offset against income tax refunds, 40 C.F.R. Part 13, Subparts C and H; and
- c. suspend or revoke Respondent's licenses or other privileges, or suspend or disqualify Respondent from doing business with the EPA or engaging in programs the EPA sponsors or funds, 40 C.F.R. § 13.17.

Conditions of Settlement

89. As Conditions of Settlement, Respondent agrees to the following:
- a. Unless an earlier deadline is otherwise specified, Respondent shall have completed the installation and commenced operation of the instrumentation, controls, and monitoring systems set forth in Appendix A for the EO/EG Flare, Polyol Flare, and TDI Flare, and operate the above-listed flares as

required in Appendix A no later than one year from the effective date of this CAFO.

- b. Permits Needed to Meet Compliance Obligations. If any compliance obligation under this CAFO requires Respondent to obtain federal, state, or local permit or approval, Respondent shall submit timely and complete applications and take all other actions necessary to obtain all such permit or approvals.
- c. Permits to Ensure Survival of CAFO Limits and Standards. By no later than ninety (90) days after the effective date of this CAFO, Respondent shall submit a complete application to the Louisiana Department of Environmental Quality (“LDEQ”) to incorporate the limits and standards in Appendix A into the federally enforceable operating permit.

Mitigation Actions

90. As a Condition of Settlement, Respondent shall implement the following Environmental Mitigation Actions (“Mitigation Actions”) within one (1) year of the effective date of this CAFO:

- a. At the Methylene Diphenyl Diisocyanate 2 (“MDI-2”) Plant, install a new packed scrubber tower to replace the existing Methylene Dianiline (MDA) unit Offgas Wash Tower.
- b. Use the new packed scrubber tower any time the MDA-2 Unit is in operation.
- c. Submit a complete application to LDEQ to incorporate the addition of the new packed scrubber tower to the MDI-2 Plant.

91. Respondent shall maintain, and present to the EPA upon request, all documents to substantiate the mitigation dollars expended and shall provide these documents to the EPA within thirty (30) days of a request by the EPA for the documents.

92. By signing this CAFO, Respondent certifies that it is not otherwise required by law to perform the Mitigation Actions described in Paragraph 90, that Respondent is unaware of any other person who is required by law to perform the Mitigation Actions, and that Respondent will not use any Mitigation Actions, or portion thereof, to satisfy any obligations that it may have under other applicable requirements of law.

93. Respondent shall complete the Mitigation Actions described in Paragraph 90 within one (1) year of the effective date of this CAFO, and shall notify the EPA upon completion of the Mitigation Actions.

94. Within sixty (60) days following the completion of the Mitigation Actions required under this CAFO, Respondent shall submit to the EPA a report that documents: the date that the Mitigation Action was completed; Respondent's results of implementing the Mitigation Action, including the emission reductions or other environmental benefits achieved; and the cost expended by Respondent in implementing the Mitigation Action.

Certificate of Completion

95. At such time as the Respondent believes that it has complied with all terms and conditions of Paragraphs 83–85 (payment of EPA Penalty), that it has achieved compliance with the requirements of Paragraph 89 and Appendix A (Conditions of Settlement), and that it has achieved compliance with Paragraph 90 (Mitigation Actions), Respondent shall certify to EPA completion of these items and provide any necessary documentation. Respondent represents that

Re: BASF Corporation
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the signing representative will be fully authorized by Respondent to certify that the terms and conditions of this CAFO have been met. The certification should include the following statement:

“I certify under penalty of law that I have examined and am familiar with the information submitted in this document and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is, to the best of my knowledge, true, accurate, and complete. I am aware that there are significant penalties for knowingly submitting false information, including the possibility of fines and imprisonment.”

The certification required above shall be sent to:

Justin Chen
Enforcement Officer (6EN-AT)
Air Enforcement Section
Compliance Assurance and Enforcement Division
U.S. EPA, Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733
Chen.Justin@epa.gov

EPA has 90 days to respond with questions or disagreement that the conditions of the CAFO have been satisfied.

96. Respondent agrees that the time period from the Effective Date of this CAFO until all the conditions specified in Paragraph 89 and Appendix A (Conditions of Settlement) and Paragraph 90 (Mitigation Actions) are completed (the “Tolling Period”) shall not be included in computing the running of any statute of limitations potentially applicable to any action brought by Complainant on any claims set forth in Section E of this CAFO (the “Tolled Claims”). Respondent shall not assert, plead, or raise in any fashion, whether by answer, motion or otherwise, any defense of laches, estoppel, or waiver, or other similar equitable defense based on the running of any statute of limitations or the passage of time during the Tolling Period in any action brought on the Tolled Claims.

97. The provisions of this CAFO shall apply to and be binding upon Respondent and its officers, directors, employees, agents, trustees, servants, authorized representatives, successors and assigns. From the Effective Date of this Agreement until the end of the Tolling Period, as set out in Paragraph 96, Respondent must give written notice and a copy of this CAFO to any successors in interest prior to transfer of ownership or control of any portion or interest in the Facility. Simultaneously with such notice, Respondent shall provide written notice of such transfer, assignment, or delegation to the EPA. In the event of any such transfer, assignment or delegation, Respondent shall continue to be bound by the obligations or liabilities of this CAFO until the EPA has provided written approval to remove said obligations or liabilities.

98. By signing this CAFO, Respondent acknowledges that this CAFO will be available to the public and agrees that this CAFO does not contain any confidential business information.

99. By signing this CAFO, the undersigned representative of Complainant and the undersigned representative of Respondent each certify that he or she is fully authorized to execute and enter into the terms and conditions of this CAFO and has legal capacity to bind the party he or she represents to this CAFO.

100. By signing this CAFO, Respondent certifies that the information it has supplied concerning this matter was at the time of submission, and is, to the best of its knowledge and belief, truthful, accurate, and complete for each submission, response, and statement. Respondent acknowledges that there are significant penalties for submitting false or misleading information, including the possibility of fines and imprisonment for knowing submission of such information, under 18 U.S.C. § 1001.

101. Respondent specifically waives its right to seek reimbursement of its costs and attorney's fees under 5 U.S.C. § 504 and 40 C.F.R. Part 17. Except as qualified by Paragraph 87, each party shall bear its own attorney's fees, costs, and disbursements incurred in this proceeding.

H. EFFECT OF CONSENT AGREEMENT AND FINAL ORDER

102. In accordance with 40 C.F.R. § 22.18(c), completion of the terms of this CAFO resolves only Respondent's liability for federal civil penalties for the violations and facts specifically alleged above.

103. Penalties paid pursuant to this CAFO shall not be deductible for purposes of federal taxes.

104. For purposes of the identification requirement of Section 162(f)(2)(A)(ii) of the Internal Revenue Code, 26 U.S.C. § 162(f)(2)(A)(ii), performance of Paragraphs 89-94 of Section G (Civil Penalty and Conditions of Settlement) and related Appendices A, B, C, and D is restitution or required to come into compliance with law.

105. This CAFO constitutes the entire agreement and understanding of the Parties and supersedes any prior agreements or understandings, whether written or oral, among the Parties with respect to the specific subject matter hereof relating to the EO/EG Flare, the Polyol Flare, and the TDI Flare.

106. In relation to this Section 114 Request, the Parties have also entered into an Administrative Consent Order ("ACO"), In the Matter of BASF Corporation, Docket No. CAA-06-2018-3314, that separately and independently governs other flares at the Facility not covered by this CAFO, namely, the Aniline Y502 Flare and the Aniline Y503 Flare. The terms of that ACO shall not affect the terms of this CAFO, this proceeding, or any subsequent proceeding related to this CAFO.

107. The terms, conditions, and compliance requirements of this CAFO may not be modified or amended except upon the written agreement of both Parties, and approval of the Regional Judicial Officer. The correction of errors and other non-substantive changes are not material terms and may be modified by written agreement of the Parties.

108. Any violation of the included Final Order may result in a civil judicial action for an injunction or civil penalties of up to \$97,229 per day of violation, or both, as provided in Section 113(b)(2) of the Act, 42 U.S.C. § 7413(b)(2), as well as criminal sanctions as provided in Section 113(c) of the Act, 42 U.S.C. § 7413(c). The EPA may use any information submitted under this CAFO in an administrative, civil judicial, or criminal action.

109. Nothing in this CAFO shall relieve Respondent of the duty to comply with all applicable provisions of the Act and other federal, state, or local laws or statutes, nor shall it restrict the EPA's authority to seek compliance with any applicable laws or regulations, nor shall it be construed to be a ruling on, or a determination of, any issue related to any federal, state, or local permit.

110. Nothing herein shall be construed to limit the power of the EPA to undertake any action against Respondent or any person in response to conditions that may present an imminent and substantial endangerment to the public health, welfare, or the environment.

I. EFFECTIVE DATE

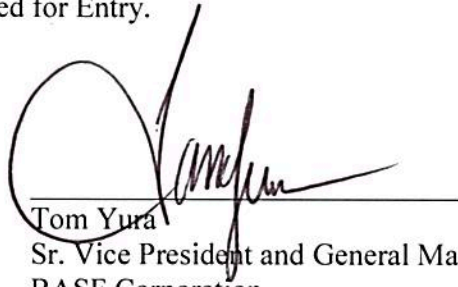
111. Respondent and Complainant agree to the issuance of the included Final Order. Upon filing the EPA will transmit a copy of the filed CAFO to the Respondent. This CAFO shall become effective after execution of the Final Order by the Regional Judicial Officer on the date of filing with the Hearing Clerk.

Re: BASF Corporation
Docket No. CAA-06-2018-3313

The foregoing Consent Agreement In the Matter of BASF Corp., Docket No. CAA-06-2018-3313,
is Hereby Stipulated, Agreed, and Approved for Entry.

FOR RESPONDENT:

Date: 8-13-18

A handwritten signature in black ink, appearing to read 'Tom Yura', is written over a horizontal line. The signature is stylized and cursive.

Tom Yura
Sr. Vice President and General Manager
BASF Corporation
P.O. Box 457
Geismar, LA 70734-0457

Re: BASF Corporation
Docket No. CAA-06-2018-3313

FOR COMPLAINANT:

Date: 8/15/18



Cheryl T. Seager
Director
Compliance Assurance and
Enforcement Division

Re: BASF Corporation
Docket No. CAA-06-2018-3313

CERTIFICATE OF SERVICE

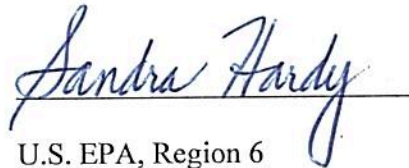
I hereby certify that on the 16th day of August, 2018, the original and one copy of the foregoing Consent Agreement and Final Order was hand delivered to the Regional Hearing Clerk, U.S. EPA - Region 6, 1445 Ross Avenue, Suite 1200, Dallas, Texas 75202-2733, and a true and correct copy was delivered to the following individual(s) by the method indicated below:

CERTIFIED MAIL - RETURN RECEIPT REQUESTED 70073020000015228762

Tom Yura
Sr. Vice President and General Manager
BASF Corporation
P.O. Box 457
Geismar, LA 70734-0457

CERTIFIED MAIL - RETURN RECEIPT REQUESTED 70073020000015228779

Madeleine Kadas
Beveridge & Diamond, PC
98 San Jacinto Blvd.
Ste. 1420
Austin, TX 78701



U.S. EPA, Region 6
Dallas, Texas

Re: BASF Corporation
Docket No. CAA-06-2018-3313

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION 6
DALLAS, TEXAS

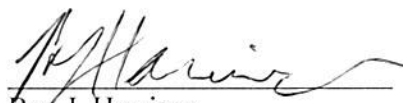
IN THE MATTER OF: (DOCKET NO. CAA-06-2018-3313
(
(
BASF CORPORATION ()
GEISMAR, LOUISIANA, 70734 ()
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RESPONDENT. ()
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FINAL ORDER

Pursuant to Section 113(d) of the Clean Air Act ("CAA" or the "Act"), 42 U.S.C. §7413(d), and the Consolidated Rules of Practice Governing the Administrative Assessment of Civil Penalties, 40 C.F.R. Part 22, the attached Consent Agreement resolving this matter is incorporated by reference into this Final Order and is hereby ratified.

Respondent is ORDERED to comply with all terms of the Consent Agreement. In accordance with 40 C.F.R. §22.31(b), this Final Order shall become effective upon filing with the Regional Hearing Clerk.

Dated 8/16/2018


Ben J. Harrison
Regional Judicial Officer
U.S. EPA, Region 6

Re: BASF Corporation
Docket No. CAA-06-2018-3313

CERTIFICATE OF SERVICE

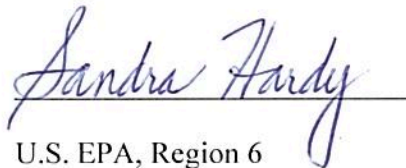
I hereby certify that on the 16th day of August, 2018, the original and one copy of the foregoing Consent Agreement and Final Order was hand delivered to the Regional Hearing Clerk, U.S. EPA - Region 6, 1445 Ross Avenue, Suite 1200, Dallas, Texas 75202-2733, and a true and correct copy was delivered to the following individual(s) by the method indicated below:

CERTIFIED MAIL - RETURN RECEIPT REQUESTED 70073020000015228762

Tom Yura
Sr. Vice President and General Manager
BASF Corporation
P.O. Box 457
Geismar, LA 70734-0457

CERTIFIED MAIL - RETURN RECEIPT REQUESTED 70073020000015228779

Madeleine Kadas
Beveridge & Diamond, PC
98 San Jacinto Blvd.
Ste. 1420
Austin, TX 78701



U.S. EPA, Region 6
Dallas, Texas

APPENDIX A

INSTRUMENTATION AND MONITORING SYSTEMS

A1. Schedule for Submission of Flare Data and Monitoring Systems and Protocol Reports (“Flare Data and Monitoring Systems and Protocol Reports”) and Installation and Operation of Monitoring Systems. This schedule includes equipment planning and installation for the following flares at the BASF Geismar Facility: the Polyol Flare (“Flare 13” or “Polyol Flare”), a non-assisted flare; the EO/EG Flare (“Flare 10” or “EO/EG Flare”), a steam-assisted flare, the TDI Flare (“Flare 14” or “TDI Flare”), a steam-assisted flare.

- a. By the effective date of this CAFO, BASF shall implement the following at the EO/EG Flare and the TDI Flare:
 - i. At the EO/EG Flare, BASF shall install a monitoring system capable of continuously measuring, calculating, and recording the volumetric flow rate of Assist Steam consistent with the requirements set forth in Paragraph A2 of this Appendix.
 - ii. At the TDI Flare, BASF shall initiate installation of the vent gas flow meter transducers by purchasing, fabricating, and installing a spool piece at the flare.
- b. No later than three months after the effective date of this CAFO, BASF shall submit a “Flare Data and Monitoring Systems and Protocol Report” for the Polyol Flare to EPA that includes the following:
 - i. A detailed description of each instrument and piece of monitoring equipment, including the specific model and manufacturer, that has been or will be installed at the Polyol Flare in compliance with Paragraphs A2 and A5.b.ii of this Appendix.
 - ii. A detailed timeline for installation of any monitoring equipment that will be installed at the Polyol Flare in compliance with Paragraphs A2 and A5.b.ii of this Appendix. The timeline shall run no longer than one year from the effective date of this CAFO.
- c. No later than three months after the effective date of this CAFO, BASF shall submit a report to EPA concerning the EO/EG Flare and the TDI Flare that includes the following:
 - i. A narrative description of the monitoring methods and calculations that BASF will use to comply with Paragraph A10 of this Appendix and the NHV_{CZ} requirements in this CAFO for the EO/EG Flare and TDI Flare.

- d. By the dates stipulated in this CAFO:
 - i. By no later than six months after the effective date of this CAFO, BASF shall make the following equipment installations at the TDI Flare:
 - (A) Vent Gas and Assist Steam monitoring systems consistent with the requirements set forth in Paragraph A2 of this Appendix.
 - ii. BASF shall operate the EO/EG Flare and the TDI Flare in a manner consistent with the requirements of Paragraph A10 of this Appendix and the NHV_{CZ} requirements in this CAFO.
- e. In accordance with the timeline established in the Flare Data and Monitoring Systems and Protocol Report for the Polyol Flare, BASF shall complete installation of all equipment required to comply with Paragraphs A2 and A5.b.ii of this Appendix at the Polyol Flare.

A2. Vent Gas and Assist Steam Monitoring Systems. This Paragraph applies to the EO/EO Flare, the TDI Flare (collectively, the “Steam-Assisted Flares”), and the Polyol Flare (the “Non-Assisted Flare”).

- a. At the Steam-Assisted Flares and Non-Assisted Flare, BASF shall install, operate, calibrate, and maintain a monitoring system capable of continuously measuring, calculating, and recording the volumetric flow rate of Vent Gas (which includes Waste, Sweep, Purge, and any Supplemental Gas used) in the header(s) that feed the flare. Different flow monitoring methods may be used to measure different gaseous streams that make up the Vent Gas, provided that the flow rates of all gas streams that contribute to the Vent Gas are determined.
- b. At each Steam-Assisted Flare, BASF shall install, operate, calibrate, and maintain a monitoring system capable of continuously measuring, calculating, and recording the volumetric flow rate of Assist Steam used with the flare.
- c. Each flow rate monitoring system must be able to correct for the temperature and pressure of the system and output parameters in standard conditions (i.e., a temperature of 20 °C (68 °F) and a pressure of 1 atmosphere).
- d. In lieu of a monitoring system that directly measures volumetric flow rate, BASF may choose from the following additional options for monitoring any gas stream:
 - i. Mass flow monitors may be used for determining the volumetric flow rate of Steam provided that BASF converts the mass flow rates to volumetric flow rates pursuant to the methodology in Step 2 of Appendix D;

- ii. Mass flow monitors may be used for determining the volumetric flow rate of Vent Gas, provided BASF determines the molecular weight of such Vent Gas using compositional analysis data collected pursuant to the monitoring method specified in Paragraph A3.a or A3.b and provided that BASF converts the mass flow rates to volumetric flow rates pursuant to the methodology in Step 2 of Appendix D; and
- iii. Continuous pressure/temperature monitoring system(s) and appropriate engineering calculations may be used in lieu of a continuous volumetric flow monitoring system provided the molecular weight of the gas is known and provided BASF complies with the methodology in Step 2 of Appendix D for calculating volumetric flow rates. For Vent Gas, BASF must determine molecular weight using compositional analysis data collected pursuant to the monitoring method specified in Paragraph A3.a or A3.b.

A3. Vent Gas Compositional Monitoring or Direct Monitoring of Net Heating Value of Vent Gas of Steam-Assisted Flares. Paragraph A3 applies to the Steam-Assisted Flares. For each Steam-Assisted Flare, BASF shall determine the concentration of individual components in the Vent Gas or shall directly monitor the Net Heating Value of the Vent Gas (NHV_{VG}) in compliance with one of the methods specified in Subparagraphs A3.a–A3.c. BASF may elect to use different monitoring methods (of the methods provided in Subparagraphs A3.a–A3.c) for different gaseous streams that make up the Vent Gas, provided that the composition or Net Heating Value of all gas streams that contribute to the Vent Gas are determined.

- a. Install, operate, calibrate, and maintain a monitoring system capable of continuously measuring (i.e., at least once every 15 minutes), calculating, and recording the individual component concentrations present in the Vent Gas;¹ or
- b. Install, operate, calibrate, and maintain a calorimeter capable of continuously measuring, calculating, and recording the NHV_{VG} at standard conditions. If BASF elects this method, BASF may, at its discretion, install, operate, calibrate, and maintain a monitoring system capable of continuously measuring, calculating, and recording the hydrogen concentration in the Vent Gas;
- c. Direct compositional or Net Heating Value monitoring is not required for purchased (“pipeline quality”) natural gas streams. The Net Heating Value of purchased natural gas streams may be determined using annual or more frequent grab sampling at any one representative location. Alternatively, the Net

¹ If BASF chooses not to install a gas chromatograph as a means of compliance at the Steam-Assisted Flares, the requirements of Paragraphs A3.a and A6.c of this Appendix A, Paragraph B5 of Appendix B, and Paragraph C2 of Appendix C shall not apply.

Heating Value of any purchased natural gas stream can be assumed to be 920 BTU/scf.

A4. Vent Gas Compositional Monitoring or Direct Monitoring of Net Heating Value of Vent Gas of the Non-Assisted Flare. Paragraph A4 applies to the Non-Assisted Flare. For the Non-Assisted Flare, BASF has determined the total concentration of components in the Waste Gas provide no substantial heating value. BASF may elect to use different monitoring methods (of the methods provided in Subparagraphs A4.a and A4.b) for different gaseous streams that make up the Vent Gas, provided that the composition or Net Heating Value of all gas streams that contribute to the Vent Gas are determined.

- a. Assume that the Net Heating Value of the Waste Gas equals to 0 BTU/scf; and
- b. Direct compositional or Net Heating Value monitoring is not required for purchased (“pipeline quality”) natural gas streams. The Net Heating Value of purchased natural gas streams may be determined using annual or more frequent grab sampling at any one representative location. Alternatively, the Net Heating Value of any purchased natural gas stream can be assumed to be 920 BTU/scf.

A5. Automated Equipment Controls.

- a. Steam Control. At each Steam-Assisted Flare, BASF shall install, operate, calibrate, and maintain equipment, including main and trim control valves and piping, that enables BASF to control Assist Steam flow in a manner sufficient to ensure compliance with this CAFO.
 - i. At each Steam-Assisted Flare, BASF shall install and operate automated controls to automatically adjust the steam flow rates with changes to the Vent Gas flow rates to maintain the NHV_{CZ} standard.
- b. Supplemental Gas Control.
 - i. At each Steam-Assisted Flare, BASF shall install and operate automated controls of the supplemental gas rate in relation to the vent gas flow rate to ensure compliance with the NHV_{VG} requirement and NHV_{CZ} standard.
 - ii. At each Non-Assisted Flare, BASF shall install and operate automated controls of the supplemental gas rate in relation to the vent gas flow rate to ensure compliance with the NHV_{VG} requirement.

A6. Instrumentation and Monitoring Systems: Specifications, Calibration, Quality Control, and Maintenance.

- a. The instrumentation and monitoring systems identified in Paragraphs A2 and A3 of this Appendix A shall:
 - i. Meet or exceed all applicable minimum accuracy, calibration, and quality control requirements specified in Appendix B;
 - ii. Have an associated readout (i.e., a visual display or record) or other indication of the monitored operating parameter that is readily accessible onsite for operational control or inspection by BASF;
 - iii. Be capable of measuring the appropriate parameter over the range of values expected for that measurement location; and
 - iv. Have an associated data recording system with a resolution that is equal to or better than the required instrumentation/system accuracy.
- b. BASF shall operate, maintain, and calibrate each instrumentation and monitoring system identified in Paragraphs A2 and A3 according to a continuous parametric monitoring system ("CPMS") monitoring plan that contains the information listed in Appendix C, Paragraph C1.
- c. All monitoring systems that fall under the monitoring method in Paragraph A3.a must also meet the requirements of Appendix C, Paragraph C2.
- d. For each instrumentation and monitoring system identified in Paragraphs A2 and A3, BASF shall comply with the out-of-control procedures described in Appendix C, Paragraph C3.
- e. For each instrumentation and monitoring system identified in Paragraphs A2 and A3, BASF shall comply with the data reduction requirements specified in Appendix C, Paragraph C4.

A7. Instrumentation and Monitoring Systems: Recording and Averaging Times. The instrumentation and monitoring systems identified in Paragraphs A2 and A3 shall be able to produce and record data measurements and calculations for each parameter at the following time intervals.

<u>Instrumentation and Monitoring System</u>	<u>Recording and Averaging Times</u>
Vent Gas (including Waste, Sweep, Purge, and Supplemental) and Assist Steam Flow Monitoring Systems	Measure continuously and record 15-minute block averages
Vent Gas Compositional Monitoring (if using the methodology in Paragraph A3.a)	Measure no less than once every 15 minutes and record that value
Vent Gas Net Heating Value Analyzer (if using the methodology in Paragraph A3.b)	Measure continuously and record 15-minute block averages

Nothing in this Paragraph is intended to prohibit BASF from setting up process control logic that uses different averaging times from those in this table provided that the recording and averaging times in this table are available and used for determining compliance with this CAFO.

A8. Instrumentation and Monitoring Systems: Operation. For each Non-Assisted Flare and Steam-Assisted Flare, except for periods of Monitoring System Malfunctions, repairs associated with Monitoring System Malfunctions, and required monitoring system quality assurance or quality control activities (including, as applicable, calibration checks and required zero and span adjustments), BASF shall operate each of the instruments and monitoring systems required in Paragraphs A2 and A3 and collect data on a continuous basis at all times the flare is capable of receiving Sweep, Supplemental, and/or Waste Gas.

A9. General Emission Standards Applicable to each Non-Assisted Flare and Steam-Assisted Flare. By the Effective Date of the CAFO, BASF shall comply with the requirements set forth in this Paragraph at all times when each flare is In Operation.

- a. Operation during Vent Gas Venting. BASF shall operate the flare at all times when Vent Gas may be vented to it.
- b. Pilot Flame Presence. BASF shall comply with the requirements of the Facility's Title V permit applicable to the flare and 40 C.F.R. § 63.11(b)(5).
- c. No Visible Emissions. BASF shall comply with the requirements of the Facility's Title V permit applicable to the flare and 40 C.F.R. § 63.11(b)(4).
- d. Flare Tip Velocity. BASF shall comply with the requirements of the Facility's Title V permit applicable to the flare and 40 C.F.R. § 63.11(b)(7).
- e. Monitoring According to Applicable Provisions. BASF shall comply with all applicable Subparts of 40 C.F.R. Parts 60, 61, and 63 which state how a particular flare must be monitored.

- f. Good Air Pollution Control Practices. At all times, including during periods of Startup, Shutdown, and/or Malfunction, BASF shall implement good air pollution control practices to minimize emissions from each flare.

A10. Net Heating Value of Combustion Zone Gas (NHV_{CZ}).

- a. By no later than one year from the effective date of this CAFO, at any time that Waste Gas is routed to the EO/EG Flare for at least 15 minutes, BASF shall operate the flare to maintain the NHV_{CZ} at or above 270 BTU/scf determined on a 15-minute block period basis. BASF shall monitor and calculate NHV_{CZ} in accordance with Appendix D.
- b. By no later than six months after the effective date of this CAFO, at any time that Waste Gas is routed to the TDI Flare with steam assist for at least 15 minutes, BASF shall operate the flare to maintain the NHV_{CZ} at or above 270 BTU/scf determined on a 15-minute block period basis. BASF shall monitor and calculate NHV_{CZ} in accordance with Appendix D.

A11. Recordkeeping: Timing and Substance. At all times that Paragraph A10 applies, BASF shall comply with the recordkeeping requirements to calculate and record each of the following parameters:

- a. Volumetric flow rates of all gas streams that contribute to the Vent Gas volumetric flow rate (in scfm) (in 15-minute block averages and in accordance with any calculation requirements of Paragraph A3 and Step 2 of Appendix D);
- b. Assist Steam volumetric flow rate (in scfm) (in 15-minute block averages and in accordance with any calculation requirements of Paragraph A3 and Step 2 of Appendix D);
- c. NHV_{VG} (in BTU/scf) (in 15-minute block averages in accordance with Step 1 of Appendix D);
- d. NHV_{CZ} (in BTU/scf) (in 15-minute block averages in accordance with Step 3 of Appendix D).

APPENDIX B

**TECHNICAL SPECIFICATIONS AND QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS
FOR CONTINUOUS PARAMETRIC MONITORING SYSTEMS (“CPMS”)**

The values and requirements listed below are the minimally acceptable standards for the requisite CPMS. Standards better than or beyond these are acceptable.

B1. Vent Gas Flow Meter

- a. Velocity Range: 0.1–250 ft/sec
- b. Repeatability: $\pm 1\%$ of reading over the velocity range
- c. Design Accuracy: $\pm 5\%$ initially to 40%, 60%, and 90% of monitor full scale as certified by the manufacturer
- d. Operational Accuracy: $\pm 20\%$ of reading over the velocity range of 0.1-1 ft/s and $\pm 5\%$ of reading over the velocity range of 1–250 ft/s
- e. Installation: Applicable AGA, ANSI, API, or equivalent standard
- f. Flow Rate Determination: Must be corrected to one atmosphere pressure and 68 degrees Fahrenheit ($^{\circ}\text{F}$)
- g. QA/QC: Annual calibration shall be conducted in accordance with the manufacturer’s recommendations.
- h. Pressure and Temperature Sensors: *See* Paragraph B4 below.

B2. Vent Gas Average Molecular Weight Analyzer
(may be part of the Vent Gas Flow Meter)

- a. Molecular Weight Range and Accuracy:
 - i. Range: 2 to 120 gr/gr-mol
 - ii. Accuracy: $\pm 2\%$

B3. Steam Flow Meter

- a. Repeatability: $\pm 1\%$ of reading over the range of the instrument
- b. Accuracy: $\pm 1\%$ from 100% to 15% of span
 $\pm 2\%$ from 15% to 6% of span
 $\pm 3\%$ from 6% to 4% of span

- c. Installation: Applicable AGA, ANSI, API, or equivalent standard
- d. Flow Rate Determination: Must be corrected to one atmosphere pressure and 68 °F
- e. QA/QC: Annual calibration shall be conducted in accordance with the manufacturer's recommendations.
- f. Pressure and Temperature Sensors: *See* Paragraph B4 below.

B4. Vent Gas and Steam Flow Meters: Pressure and Temperature Sensors

- a. Temperature monitor must be calibrated annually to ± 1 percent over the normal range of temperature measured, expressed in degrees Celsius ($^{\circ}\text{C}$), or 2.8 $^{\circ}\text{C}$, whichever is greater.
- b. Pressure monitor must be calibrated annually to within $\pm 5\%$.

B5. Gas Chromatograph ("GC")

a. General

- i. Accuracy: The gas chromatography system shall be maintained to be accurate within 5% of full scale.
- ii. 8-Hour Repeatability:
 - $\pm 0.5\%$ of full scale for ranges from 2–100% of full scale;
 - $\pm 1\%$ of full scale for ranges from 0.05–2% of full scale;
 - $\pm 2\%$ of full scale for ranges from 50–500 ppm of full scale;
 - $\pm 3\%$ of full scale for ranges from 5–50 ppm of full scale;
 - $\pm 5\%$ of full scale for ranges from 0.5–5 ppm of full scale;
- iii. The minimum sampling frequency shall be one sample every 15 minutes.
- iv. The GC shall be capable of speciating all gas constituents listed:
 - (A) Hydrogen
 - (B) Oxygen
 - (C) Nitrogen
 - (D) Carbon Dioxide
 - (E) Carbon Monoxide
 - (F) Methane
 - (G) Ethane

- (H) Ethene
- (I) Acetylene
- (J) Propane
- (K) Propene
- (L) 2-Methylpropane
- (M) Butane
- (N) But-1-ene and 2-methylpropene (these two constituents will be measured on the same column and the reported result will be one value, the sum of the two constituents)
- (O) E-but_2_ene
- (P) Z-but-2-ene
- (Q) 1,3 butadiene
- (R) Pentane plus
- (S) Hydrogen Sulfide

Outputs from the Gas Chromatograph shall be on a mole percent basis, except for Hydrogen Sulfide which will be on a parts per million basis.

- v. The sampling system shall be heat traced and maintained at 150 °F with no cold spots. The sampling cabinet shall be maintained at no lower than 110 °F. All system components shall be heated, including the probe external to the flare piping, calibration valve, sample lines, sampling loop (or sample introduction system), and GC oven.
 - vi. Where technically feasible, the sampling location should be at least two equivalent duct diameters downstream from the nearest control device, point of pollutant generation, or other point at which a change in the pollutant concentration or emission rate occurs. The location should not be close to air in-leakages. Where technically feasible, the location should also be at least 0.5 diameters upstream from the exhaust or control device.
- b. GC Calibration Requirements: Net Heating Value Measurements. BASF shall follow the procedure set forth in Performance Specification 9 (“PS9”) of 40 C.F.R. Part 60, Appendix B, except that: a single daily mid-level calibration check can be used (rather than triplicate analysis), the multi-point calibration can be conducted quarterly (rather than monthly), and the sampling line temperature must be maintained at a minimum temperature of 60 °C (rather than 120 °C).

B6. Net Heating Value Analyzer (“NHV Analyzer”)

a. General

- i. Accuracy: $\pm 2\%$ of full scale
- ii. Repeatability: $\pm 1\%$ of reading over full scale
- iii. The minimum sampling frequency shall be one sample every 5 minutes.
- iv. Where technically feasible, the sampling location should be at least two equivalent duct diameters downstream from the nearest control device, point of pollutant generation, or other point at which a change in the pollutant concentration or emission rate occurs. The location should not be close to air in-leakages. Where technically feasible, the location should also be at least 0.5 diameters upstream from the exhaust or control device.
- v. Specify calibration requirements in your site specific CPMS monitoring plan. Calibration requirements should follow manufacturer’s recommendations at a minimum. Temperature control the sampling system to ensure proper year-round operation.

APPENDIX C

ADDITIONAL CPMS REQUIREMENTS

C1. Continuous Parametric Monitoring System (“CPMS”) Monitoring Plan. BASF shall develop and implement a CPMS quality control program documented in a CPMS monitoring plan that covers each Non-Assisted Flare and Steam-Assisted Flare and each CPMS installed to comply with the provisions of this settlement. BASF shall have the CPMS monitoring plan readily available on-site at all times and shall submit a copy of the CPMS monitoring plan to the Administrator upon request by the Administrator. The CPMS monitoring plan shall contain the information listed in Subparagraphs C1.a–d below.

- a. Identification of the parameter to be monitored by the CPMS and the expected parameter range, including worst case and normal operation.
- b. Description of the monitoring equipment, including the information specified in Subparagraphs C1.b.i–vii below.
 - i. Manufacturer and model number for all monitoring equipment components installed in compliance with applicable provisions of this CAFO.
 - ii. Performance specifications, as provided by the manufacturer, and any differences expected for this installation and operation.
 - iii. The location of the CPMS sampling probe or other interface and a justification of how the location meets the requirements of Appendix B.
 - iv. Placement of the CPMS readout, or other indication of parameter values, indicating how the location is readily accessible onsite for operational control or inspection.
 - v. Span of the CPMS. The span of the CPMS sensor and analyzer must encompass the full range of all expected values.
 - vi. How data outside of the span of the CPMS will be handled and the corrective action that will be taken to reduce and eliminate such occurrences in the future.
 - vii. Identification of the parameter detected by the parametric signal analyzer and the algorithm used to convert these values into the operating parameter monitored to demonstrate compliance, if the parameter detected is different from the operating parameter monitored.

- c. Description of the data collection and reduction systems, including the information specified in Subparagraphs C1.c.i–iii below.
 - i. A copy of the data acquisition system algorithm used to reduce the measured data into the reportable form of the standard and to calculate the applicable averages.
 - ii. Identification of whether the algorithm excludes data collected during CPMS breakdowns, out-of-control periods, repairs, maintenance periods, instrument adjustments or checks to maintain precision and accuracy, calibration checks, and zero (low-level), mid-level (if applicable) and high-level adjustments.
 - iii. If the data acquisition algorithm does not exclude data collected during CPMS breakdowns, out-of-control periods, repairs, maintenance periods, instrument adjustments or checks to maintain precision and accuracy, calibration checks, and zero (low-level), mid-level (if applicable) and high-level adjustments, a description of the procedure for excluding this data when the averages calculated as specified in paragraph C4 of this Appendix are determined.
- d. Routine quality control and assurance procedures, including descriptions of the procedures listed in Subparagraphs C1.d.i–vi and a schedule for conducting these procedures. The routine procedures must provide an assessment of CPMS performance.
 - i. Initial and subsequent calibration of the CPMS and acceptance criteria.
 - ii. Determination and adjustment of the calibration drift of the CPMS.
 - iii. Daily checks for indications that the system is responding. If the CPMS system includes an internal system check, BASF may use the results to verify the system is responding, as long as the system provides an alarm to BASF or BASF checks the internal system results daily for proper operation and the results are recorded.
 - iv. Preventive maintenance of the CPMS, including spare parts inventory.
 - v. Data recording, calculations and reporting.
 - vi. Program of corrective action for a CPMS that is not operating properly.

C2. Flare Monitoring System Requirements: Additional Requirements for Gas Chromatographs. For monitors used to determine compositional analysis for net heating value, the gas chromatograph must also meet the requirements of Subparagraphs C2.a–c below.

- a. The quality assurance requirements are in Appendix B.
- b. The calibration gases must meet one of the following options:
 - i. BASF must use a calibration gas or multiple gases that include all of compounds listed in Subparagraphs C2.b.i.(A)–(K) below that may be reasonably expected to exist in the flare gas stream and optionally include any of the compounds listed in Subparagraphs C2.b.i.(L)–(O) below. All of the calibration gases may be combined in one cylinder. If multiple calibration gases are necessary to cover all compounds, BASF must calibrate the instrument on all of the gases.
 - (A) Hydrogen.
 - (B) Methane.
 - (C) Ethane.
 - (D) Ethylene.
 - (E) Propane.
 - (F) Propylene.
 - (G) n-Butane.
 - (H) iso-Butane.
 - (I) Butene (general). It is not necessary to separately speciate butene isomers, but the net heating value of trans-butene must be used for co-eluting butene isomers.
 - (J) 1,3-Butadiene. It is not necessary to separately speciate butadiene isomers, but you must use the response factor and net heating value of 1,3-butadiene for co-eluting butadiene isomers.
 - (K) n-Pentane. Use the response factor for n-pentane to quantify all C5+ hydrocarbons.
 - (L) Acetylene (optional).
 - (M) Carbon monoxide (optional).
 - (N) Propadiene (optional).
 - (O) Hydrogen sulfide (optional).
 - ii. BASF must use a surrogate calibration gas consisting of hydrogen and C1 through C5 normal hydrocarbons. All of the calibration gases may be combined in one cylinder. If multiple calibration gases are necessary to cover all compounds, BASF must calibrate the instrument on all of the gases.

- c. If BASF chooses to use a surrogate calibration gas under Subparagraph C2.b.ii, BASF must comply with Subparagraphs C2.c.i–ii below.
 - i. Use the response factor for the nearest normal hydrocarbon (i.e., n-alkane) in the calibration mixture to quantify unknown components detected in the analysis.
 - ii. Use the response factor for n-pentane to quantify unknown components detected in the analysis that elute after n-pentane.

C3. Out-of-Control Periods. For each CPMS installed and operated to comply with the provisions set forth in Appendix A, BASF shall comply with the out-of-control procedures described in Subparagraphs C3.a–b below.

- a. A CPMS is out-of-control if the zero (low-level), mid-level (if applicable) or high-level calibration drift exceeds two times the accuracy requirement in Appendix B.
- b. When the CPMS is out of control, BASF shall take the necessary corrective action and repeat all necessary tests that indicate the system is out of control. BASF shall take corrective action and conduct retesting until the performance requirements are below the applicable limits. The beginning of the out-of-control period is the hour a performance check (e.g., calibration drift) that indicates an exceedance of the performance requirements established in this section is conducted. The end of the out-of-control period is the hour following the completion of corrective action and successful demonstration that the system is within the allowable limits. BASF shall not use data recorded during periods the CPMS is out of control in data averages and calculations, used to report emissions or operating levels, as specified in Subparagraph C4.c below.

C4. CPMS Data Reduction. BASF shall reduce data from a CPMS installed and/or operated to comply with this CAFO as specified in Subparagraphs C4.a–c below.

- a. BASF may round the data to the same number of significant digits used in that operating limit.
- b. Periods of non-operation of the process unit (or portion thereof) resulting in cessation of the emissions to which the monitoring applies must not be included in the 15-minute block averages.
- c. Periods when the CPMS is out of control must not be included in the 15-minute block averages.

APPENDIX D

CALCULATING NET HEATING VALUE OF THE COMBUSTION ZONE GAS (NHV_{CZ})

This Appendix D applies to the TDI Flare when operated with assist steam and the EO/EG Flare (collectively, “the Steam-Assisted Flares”). All abbreviations, constants, and variables are defined in the Key on Page 5 of this Appendix D.

Step 1: Determine the Net Heating Value of the Vent Gas (NHV_{VG})

BASF shall determine the Net Heating Value of the Vent Gas (NHV_{VG}) based on composition monitoring data on a 15-minute block average basis according to the following requirements. If BASF monitors separate gas streams that combine to comprise the total vent gas flow to a Steam-Assisted Flare, the 15-minute block average Net Heating Value shall be determined separately for each measurement location according to the following requirements and a flow-weighted average of the gas stream Net Heating Values shall be used to determine the 15-minute block average Net Heating Value of the cumulative Vent Gas. The NHV_{VG} 15-minute block averages shall be calculated for set 15-minute time periods starting at 12:00 midnight to 12:15 AM, 12:15 AM to 12:30 AM and so on, concluding at 11:45 PM to midnight.

Step 1a: Equation or Output to be Used to Determine NHV_{VG} at a Measurement Location

For any gas stream for which BASF complies with Paragraph A3 of Appendix A by collecting compositional analysis data in accordance with the method set forth in A3.a: Equation 1 shall be used to determine the NHV_{VG} of a specific sample by summing the Net Heating Value for each individual component by individual component volume fractions. Individual component Net Heating Values are listed in Table 1 of this Appendix D.

$$NHV_{VG} = \sum_{i=1}^n (x_i \cdot NHV_i) \quad \text{Equation 1}$$

For any gas stream for which BASF complies with Paragraph A3 of Appendix A by collecting direct Net Heating Value monitoring data in accordance with the method set forth in Paragraph A3.b but for which a Hydrogen Concentration Monitor is not used: Use the direct output (measured value) of the monitoring system(s) (in BTU/scf) to determine the NHV_{VG} for the sample.

For any gas stream for which BASF complies with Paragraph A3 of Appendix A by collecting direct Net Heating Value monitoring data in accordance with the method set forth in Paragraph A3.b and for which a Hydrogen Concentration Monitor is also used: Equation 2 shall be used to determine the NHV_{VG} for each sample measured via the Net Heating Value monitoring system. Where hydrogen concentration data is collected, Equation 2 performs a net correction for the measured heating value of hydrogen since the theoretical Net Heating Value for

hydrogen is 274 Btu/scf, but for the purposes of this CAFO, a Net Heating Value of 1,212 Btu/scf may be used ($1,212 - 274 = 938$ BTU/scf).

$$NHV_{VG} = NHV_{measured} + 938x_{H2} \quad \text{Equation 2}$$

Step 1b: Calculation Method to be Used in Applying Equation/Output to Determine NHV_{VG}

For any Steam-Assisted Flare for which BASF complies with Paragraph A3 by using a continuous monitoring system in accordance with the method set forth in A3.a or A3.b: BASF may elect to determine the 15-minute block average NHV_{VG} using either the Feed-Forward Calculation Method or the Direct Calculation Method (both described below). For each Steam-Assisted Flare, BASF must elect one calculation method that will apply at all times, and use that method for all continuously monitored flare vent streams associated with that Steam-Assisted Flare. If BASF intends to change the calculation method that applies to a Steam-Assisted Flare, BASF must notify the EPA 30 days in advance of such a change.

- (1) Feed-Forward Calculation Method. When calculating NHV_{VG} for a specific 15-minute block:
 - A. Use the results from the first sample collected during an event (for periodic Vent Gas flow events) for the first 15-minute block associated with that event.
 - B. If the results from the first sample collected during an event (for periodic Vent Gas flow events) are not available until after the second 15-minute block starts, use the results from the first sample collected during an event for the second 15-minute block associated with that event.
 - C. For all other cases, use the results that are available from the most recent sample prior to the 15-minute block period for that 15-minute block period for all Vent Gas streams. For the purpose of this requirement, use the time that the results become available rather than the time the sample was collected. For example, if a sample is collected at 12:25 AM and the analysis is completed at 12:38 AM, the results are available at 12:38 AM and these results would be used to determine compliance during the 15-minute block period from 12:45 AM to 1:00 AM.
- (2) Direct Calculation Method. When calculating NHV_{VG} for a specific 15-minute block:
 - A. If the results from the first sample collected during an event (for periodic Vent Gas flow events) are not available until after the second 15-minute block starts, use the results from the first sample collected during an event for the first 15-minute block associated with that event.

- B. For all other cases, use the arithmetic average of all NHV_{VG} measurement data results that become available during a 15-minute block to calculate the 15-minute block average for that period. For the purpose of this requirement, use the time that the results become available rather than the time the sample was collected. For example, if a sample is collected at 12:25 AM and the analysis is completed at 12:38 AM, the results are available at 12:38 AM and these results would be used to determine compliance during the 15-minute block period from 12:30 AM to 12:45 AM.

Step 2: Determine Volumetric Flow Rates of Gas Streams

BASF shall determine the volumetric flow rate in standard cubic feet (scf) of vent gas, along with the volumetric flow rates (in scf) of any Supplemental Gas, assist steam, and premix assist air, over a 15-minute block average basis. The 15-minute block average volumetric flow rates shall be calculated for set 15-minute time periods starting at 12:00 midnight to 12:15 AM, 12:15 AM to 12:30 AM and so on, concluding at 11:45 PM to midnight.

For any gas streams for which BASF complies with Paragraph A3 by using a monitoring system that directly records volumetric flow rate: Use the direct output (measured value) of the monitoring system(s) (in scf), as corrected for the temperature and pressure of the system to standard conditions (i.e., a temperature of 20 °C (68 °F) and a pressure of 1 atmosphere) to then calculate the average volumetric flow rate of that gas stream for the 15-minute block period.

For Vent Gas, assist steam, or premix assist air gas streams for which BASF complies with Paragraph A3 by using a mass flow monitor to determine volumetric flow rate: Equation 3 shall be used to determine the volumetric flow rate of Vent Gas, premix assist air, or assist steam by converting mass flow rate to volumetric flow at standard conditions (i.e., a temperature of 20 °C (68 °F) and a pressure of 1 atmosphere). Equation 3 uses the molecular weight of the gas stream as an input to the equation; therefore, if BASF elects to use a mass flow monitor to determine volumetric flow rate of Vent Gas, BASF must collect compositional analysis data for such Vent Gas in accordance with the method set forth in A3.a. For assist steam, use a molecular weight of 18 pounds per pound-mole. For assist air, use a molecular weight of 29 pounds per pound-mole. The converted volumetric flow rates at standard conditions from Equation 3 shall then be used to calculate the average volumetric flow rate of that gas stream for the 15-minute block period.

$$Q_{vol} = \frac{Q_{mass} * 385.3}{MWt} \qquad \text{Equation 3}$$

For gas streams for which the molecular weight of the gas is known and for which BASF complies with Paragraph A3 by using a continuous pressure/temperature monitoring system(s): Use appropriate engineering calculations to determine the average volumetric flow rate of that gas stream for the 15-minute block period. For assist steam, use a molecular weight of 18 pounds per pound-mole. For assist air, use a molecular weight of 29 pounds per pound-mole.

For Vent Gas, molecular weight must be determined by collecting compositional analysis data for such Vent Gas in accordance with the method set forth in A3.a.

Step 3: Calculate the Net Heating Value of the Combustion Zone Gas (NHV_{CZ})

For any Steam-Assisted Flare at which: 1) the Feed-Forward Calculation Method is used; 2) gas composition or Net Heating Value monitoring is performed in a location representative of the cumulative vent gas stream; and 3) Supplemental Gas flow additions to the flare are directly monitored: Equation 4 shall be used to determine the 15-minute block average NHV_{CZ} based on the 15-minute block average vent gas, supplemental gas, and assist gas flow rates.

$$NHV_{CZ} = \frac{(Q_{vg} - Q_{NG2} + Q_{NG1}) * NHV_{vg} + (Q_{NG2} - Q_{NG1}) * NHV_{NG}}{Q_{vg} + Q_s + Q_{a,premix}} \quad \text{Equation 4}$$

For the first 15-minute block period of an event, Q_{NG1} shall use the volumetric flow value for the current 15-minute block period (i.e. $Q_{NG1} = Q_{NG2}$). NHV_{NG} shall be determined using one of the following methods: 1) direct compositional or Net Heating Value monitoring of the natural gas stream in accordance with Step 1; or 2) for purchased (“pipeline quality”) natural gas streams, BASF may elect to either: a) use annual or more frequent grab sampling at any one representative location; or b) assume a Net Heating Value of 920 BTU/scf.

For all other Steam-Assisted Flares: Equation 5 shall be used to determine the 15-minute block average NHV_{CZ} based on the 15-minute block average vent gas and assist gas flow rates. For periods when there is no Assist Steam flow or Premix Assist Air flow, $NHV_{CZ} = NHV_{vg}$.

$$NHV_{CZ} = \frac{Q_{vg} * NHV_{vg}}{Q_{vg} + Q_s + Q_{a,premix}} \quad \text{Equation 5}$$

Step 4: Ensure that during flare operation, NHV_{CZ} ≥ 270 BTU/scf

The flare must be operated to ensure that NHV_{CZ} is equal to or above 270 BTU/scf, as determined for each 15-minute block period when Supplemental, Sweep, and/or Waste Gas is routed to a Steam-Assisted Flare for at least 15-minutes. Equation 6 shows this relationship.

$$NHV_{CZ} \geq 270 \text{ BTU/scf} \quad \text{Equation 6}$$

Key to the Abbreviations:

385.3 = conversion factor (scf/lb-mol)
 i = individual component in Vent Gas (unitless)
 MW_t = molecular weight of the gas at the flow monitoring location (lb/lb-mol)
 n = number of components in Vent Gas (unitless)
 NHV_{CZ} = Net Heating Value of Combustion Zone Gas (BTU/scf)
 NHV_i = Net Heating Value of component i according to Table 1 of this Appendix (BTU/scf)
 $NHV_{measured}$ = Net Heating Value of Vent Gas stream as measured by monitoring system (BTU/scf)
 NHV_{NG} = Net Heating Value of Supplemental Gas to flare during the 15 – minute block period (BTU/scf)
 NHV_{VG} = Net Heating Value of Vent Gas (BTU/scf)
 $Q_{a,premix}$ = cumulative vol flow of premix assist air during the 15 – minute block period (scf)
 Q_{mass} = massflow rate (pounds per second)
 Q_{NG1} =
cumulative vol flow of Supplemental Gas (measured as total natural gas flow to the flare) to flare during previous 15 – minute block period (scf)
 Q_{NG2} =
cumulative vol flow of Supplemental Gas (measured as total natural gas flow to the flare) to flare during the 15 – minute block period (scf)
 Q_s = cumulative vol flow of Total Steam during the 15 – minute block period (scf)
 Q_{vg} = cumulative vol flow of Vent Gas during the 15 – minute block period (scf)
 Q_{vol} = volumetric flow rate (scf per second)
 x_i = concentration of component i in Vent Gas (vol fraction)
 x_{H2} = concentration of H2 in Vent Gas at time sample was input into NHV monitoring system (vol fraction)

Table 1
Individual Component Properties

Component	Molecular Formula	MW _i (pounds per pound-mole)	CMN _i (mole per mole)	NHV _i (British thermal units per standard cubic foot)	LFL _i (volume %)
Acetylene	C ₂ H ₂	26.04	2	1,404	2.5
Benzene	C ₆ H ₆	78.11	6	3,591	1.3
1,2-Butadiene	C ₄ H ₆	54.09	4	2,794	2.0
1,3-Butadiene	C ₄ H ₆	54.09	4	2,690	2.0
iso-Butane	C ₄ H ₁₀	58.12	4	2,957	1.8
n-Butane	C ₄ H ₁₀	58.12	4	2,968	1.8
cis-Butene	C ₄ H ₈	56.11	4	2,830	1.6
iso-Butene	C ₄ H ₈	56.11	4	2,928	1.8
trans-Butene	C ₄ H ₈	56.11	4	2,826	1.7
Carbon Dioxide	CO ₂	44.01	1	0	∞
Carbon Monoxide	CO	28.01	1	316	12.5
Cyclopropane	C ₃ H ₆	42.08	3	2,185	2.4
Ethane	C ₂ H ₆	30.07	2	1,595	3.0
Ethylene	C ₂ H ₄	28.05	2	1,477	2.7
Hydrogen	H ₂	2.02	0	1,212 ^A	4.0
Hydrogen Sulfide	H ₂ S	34.08	0	587	4.0
Methane	CH ₄	16.04	1	896	5.0
Methyl-Acetylene	C ₃ H ₄	40.06	3	2,088	1.7
Nitrogen	N ₂	28.01	0	0	∞
Oxygen	O ₂	32.00	0	0	∞
Pentane+ (C5+)	C ₅ H ₁₂	72.15	5	3,655	1.4
Propadiene	C ₃ H ₄	40.06	3	2,066	2.16
Propane	C ₃ H ₈	44.10	3	2,281	2.1
Propylene	C ₃ H ₆	42.08	3	2,150	2.4
Water	H ₂ O	18.02	0	0	∞

^A The theoretical Net Heating Value for hydrogen is 274 Btu/scf, but for the purposes of this Consent Agreement, a Net Heating Value of 1,212 Btu/scf shall be used.

Note: If a component is not specified in this Table 1, the heats of combustion may be determined using any published values where the net enthalpy per mole of vent gas is based on combustion at 25°C and 1 atmosphere (or constant pressure) with offgas water in the gaseous state, but the standard temperature for determining the volume corresponding to one mole of vent gas is 20°C.