



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

August 7, 2012

Mr. Steven D. Cook  
Senior Corporate Counsel  
Lyondell Chemical Company  
1221 McKinney St.  
Houston, TX 77010

RE: Complaint, Compliance Order, and Consent Agreement and Final Order  
Docket Number CAA-06-2012-3320  
Equistar Chemicals, LP, Equistar Chemical Baytown Complex, AFS 4821011882

Dear Mr. Cook,

Please find enclosed a fully executed copy of the Complaint, Compliance Order, and Consent Agreement and Final Order (combo) in the above referenced matter. Equistar Chemicals, LP (Equistar) will have thirty (30) days from the effective date of the combo to pay the civil penalty of Forty Five Thousand Dollars (\$45,000.00). Equistar will also have one year from the effective date of the combo to complete the Additional Terms of Settlement as described in the document.

If you have any questions, please feel free to contact me at 214-665-2121. Thank you for your assistance with this matter.

Sincerely,

A handwritten signature in black ink that reads "Jan Gerro". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Jan Gerro  
Senior Enforcement Counsel

Enclosure

Cc: Regional Hearing Clerk

Michael de la Cruz, Air Enforcement Section Manager (MC 149)  
Texas Commission of Environmental Quality



2. The Complaint alleges that Respondent violated regulations promulgated under the CAA at its Equistar Chemicals Bayport Complex, a chemical manufacturing plant located in Pasadena, Texas.

3. For purposes of this proceeding, Respondent admits the jurisdictional allegations of this Complaint.

4. Respondent consents to the issuance of this CAFO hereinafter recited and to the assessment and payment of the stated civil penalty in the amount and by the method set out in this CAFO and agrees to additional terms of settlement set forth in Paragraphs 56 through 61, and the Appendix to this CAFO.

5. Respondent waives any right to contest the allegations in the CAFO and its right to appeal the Final Order set forth herein, and Respondent waives all defenses which have been raised or could have been raised to the claims set forth in the CAFO.

6. Compliance with all the terms and conditions of this CAFO shall resolve Respondent's liability for federal civil penalties for the violations alleged in this CAFO.

7. Respondent shall not assert, and may not maintain, any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, or claim-splitting for violations not alleged in this Complaint.

8. Nothing in this CAFO shall be construed to prevent or limit the civil and criminal authorities of the United States Environmental Protection Agency (EPA), or that of other federal, state, or local agencies or departments to obtain penalties or injunctive relief under other federal, state, or local laws or regulations.

9. Respondent represents that it is duly authorized to execute this CAFO and that the party signing this CAFO on behalf of the Respondent is duly authorized to bind the Respondent to the terms and conditions of this CAFO.

10. Respondent agrees that the provisions of this CAFO shall be binding on its officers, directors, employees, agents, servants, authorized representatives, successors, and assigns.

## **II. STATUTORY AND REGULATORY BACKGROUND**

11. Section 101(b)(1) of the CAA, 42 U.S.C. § 7401(b)(1), states that the statute is designed to protect and enhance the quality of the nation's air so as to promote the public health and welfare and the productive capacity of its population.

### **A. New Sources Performance Standards (NSPS)**

12. Section 111(b)(1)(A) of the CAA, 42 U.S.C. § 7411(b)(1)(A), requires the Administrator of the United States Environmental Protection Agency to publish a list of categories of stationary sources that in his judgment cause, or contribute significantly to, air pollution that may reasonably be anticipated to endanger public health or welfare. Section 111(b)(1)(B) of the CAA, 42 U.S.C. § 7411(b)(1)(B), requires EPA to publish standards of performance for new sources (NSPS) within each such category.

13. NSPS General Provisions apply to all source categories and are set forth at 40 C.F.R. Part 60, Subpart A, §§ 60.1-60.19.

14. On October 15, 1973, EPA published 40 C.F.R. § 60.11 of Subpart A, which sets forth requirements for compliance with standards and maintenance requirements under the NSPS.

15. 40 C.F.R. § 60.11(d) states that "at 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 practices for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Administrator which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source.”

16. On January 21, 1986, EPA published 40 C.F.R. § 60.18 of Subpart A, which sets forth requirements for general control device and work practice, including operation of flares as control devices.

17. 40 C.F.R. § 60.18(d) states that “owners or operators of flares used to comply with the provisions of this part shall monitor these control devices to assure that they are operated and maintained in conformance with their designs. Applicable subparts will provide provisions stating how owners or operators of flares shall monitor these control devices.”

**B. NESHAPS for the Synthetic Organic Chemical Manufacturing Industry, Subparts F, G, H, and I (HON MACT)**

18. Section 112(d) of the CAA, 42 U.S.C § 7412(d) establishes a technology-based control program (i.e. based on Maximum Achievable Control Technology, or MACT) to reduce stationary source emissions of HAPs. The goal of Section 112(d) of the CAA is to apply such control technology to reduce emissions, and thus reduce the potential effects of HAPs emitted from stationary sources. Section 108(a) of the CAA, 42 U.S.C. § 7408(a), requires the Administrator of EPA to identify and prepare air quality criteria for each pollutant, the emissions of which may endanger public health or welfare and the presence of which results from numerous or diverse sources, including stationary sources.

19. Section 112 of the CAA, 42 U.S.C. § 7412, directs EPA to promulgate standards to reduce emissions of listed HAPs. These standards are collectively referred to as the National Emission Standards for Hazardous Air Pollutants and are commonly referred to as NESHAPs.

20. The synthetic organic chemical manufacturing industry (SOCMI) is a listed source category pursuant to Subpart F, 40 C.F.R. § 63.100(a). The Hazardous Organic NESHAP (commonly referred to as the HON) regulates the emissions of certain organic hazardous air pollutants from SOCMI production. The HON is comprised of Subparts F, G, H, and I in 40 C.F.R. Part 63.

21. The HON applies to SOCMI process units that: (1) are part of a major source as defined in Section 112(a) of the Act; (2) produce as a primary product a SOCMI chemical listed in Table 1 of Subpart F (40 C.F.R. § 63.107, Appendix Table 1); and (3) use as a reactant or manufacture as a product, by-product, or co-product one or more of the organic HAPs listed in Table 2 of subpart F (40 C.F.R. § 63.107, Appendix Table 2). 40 C.F.R. § 63.100(b). Under the HON, “primary product” means “the product with the greatest annual design capacity on a mass basis” for an individual process unit. 40 C.F.R. § 63.100(d)(1). For the SOCMI source category under the HON, a source is comprised of all SOCMI chemical manufacturing process units that are subject to the HON and are located at contiguous or adjoining properties under common control. 40 C.F.R. § 63.101(b) (defining “Source” and “Plant Site”). Process vents are regulated emission points under the HON. 40 C.F.R. § 63.100(e).

22. 40 C.F.R. § 63.102(a) states that owners and operators of sources subject to Subpart F shall comply with the requirements of Subpart G and H of Part 63.

23. Under Subpart G, 40 C.F.R. § 63.111(b), there are two separately defined types of process vents. A “Group 1” process vent is a process vent with a flow rate greater than or equal to 0.005 standard cubic meters per minute, an organic HAP concentration greater than or equal to 50 parts per million by volume (ppmv), and a Total Resource Effectiveness (TRE) index value<sup>1</sup> of less than or equal to 1.0. “Group 2” process vents are vents that are not Group 1 process vents. Facilities have the option of leaving process vents “ungrouped” so long as such ungrouped vents comply with the HON’s process vent control requirements set forth at Section 63.113(a). *See* 40 C.F.R. § 63.113(h).

24. Gas from Group 1 or ungrouped process vents must either: (1) be reduced by 98% or be controlled to 20 ppm, whichever is less stringent; (2) be controlled by a flare; or (3) achieve and maintain a TRE index value greater than 1.0. 40 C.F.R. § 63.113(a).

25. 40 C.F.R. § 63.113(a)(1)(i) in Subpart G requires that flares serving as control devices for HON subject process vents meet the specific operational requirements of 40 C.F.R. § 63.11(b) in Subpart A (General Provisions).

26. Subpart A, 40 C.F.R. § 63.11(b)(1) requires that “owners or operators using flares to comply with the provisions of this part shall monitor these control devices to assure that they are operated and maintained in conformance with their design.”

### **III. FINDINGS OF FACT AND CONCLUSIONS OF LAW**

27. Respondent is a Delaware limited partnership doing business in the State of Texas and is a “person” as that term is defined in Section 302(e) of the CAA, 42 U.S.C. § 7602(e), and within the meaning of Section 113(d) of the CAA, 42 U.S.C. § 7413(d).

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1. The TRE index value is a measure of the supplemental total resource requirement per unit reduction of organic HAP associated with a process vent stream. The TRE index value is a cost-effectiveness index associated with an individual process vent stream and is dependent on the process vent flow rate, net heating value, total organic compounds (TOC) emission rate, and HAP emission rate. 40 C.F.R. § 63.115.

28. At all relevant times, Respondent owned and operated the Equistar Chemicals Bayport Complex, a chemical manufacturing plant located at 5761 Underwood Road in Pasadena, Harris County, Texas (the Facility).

29. The Respondent is the owner and operator of the Facility within the meaning of the CAA, Section 111(a)(5), 42 U.S.C. § 7411(a)(5); Section 112(a)(9), 42 U.S.C. § 7412(a)(9); and 40 C.F.R. §§ 60.2 and 63.2.

30. The Facility produces ethylene oxide (EO) and typically operates 24 hours a day, seven days a week, 365 days a year except for planned and unplanned shutdowns and turnarounds.

31. The Facility contains multiple “stationary sources” of air pollutants, as that term is defined in the CAA, Section 111(a)(3), 42 U.S.C. § 7411(a)(3); Section 112(a)(3), 42 U.S.C. § 7412(a)(3); and 40 C.F.R. §§ 60.2 and 63.2.

32. The Facility is a “major source” as that term is defined at Section 112(a) of the Act. 42 U.S.C. § 7412(a), and 40 C.F.R. § 63.2.

33. The Facility is subject to the CAA Title V program Federal Operating Permit (FOP) number 1373.

34. The Facility is equipped with a steam assisted flare at the Facility, referred to as Flare-1. Flare-1 is operated as a pollution control device.

35. Typically flares are designed to achieve greater than 98% combustion of organic material. Gas heating value is important in ensuring the combustion efficiency of a flare. An appropriate ratio of steam to vent gas should be maintained in order to ensure nearly complete combustion of VOCs, HAPs, and other pollutants. Over steaming causes the gas



mixture to be under heated, a considerable risk to the achievement of intended greater than 98% combustion efficiency, and the release of VOCs, HAPs, and other pollutants into the atmosphere.

36. Over steaming of a flare, therefore, is not good air pollution control, and not in conformance with flare design requirements.

#### **IV. ALLEGED VIOLATIONS**

37. The Respondent owns or operates a major source with process units that are regulated under the source category for the synthetic organic chemical manufacturing industry (SOCMI), i.e. 40 C.F.R. Part 63, Subparts F and G.

38. At the Facility, the Respondent produces as a primary product one or more of the chemicals listed in Subpart F, 40 C.F.R. § 63.107, Table 1.

39. At the Facility, the Respondent manufactures, as a product, by-product, or co-product, one or more of the organic hazardous air pollutants listed in Subpart F, 40 C.F.R. § 63.107, Table 2.

40. At the Facility, the Respondent operates either Group 1 or ungrouped process vents, as defined by Subpart G, 40 C.F.R. § 63.111(b). Respondent utilizes a flare to control the emission of waste gas from its process vents.

41. The Respondent is regulated by Subpart G, 40 C.F.R. § 63.113(a)(1)(i), which requires Respondent to meet the requirements of 40 C.F.R. § 63.11(b) in Subpart A (General Provisions).

42. 40 C.F.R. § 63.11(b)(1) requires Respondent to monitor its flares to assure they are operated and maintained in conformance with their design. Applicable subparts also provide provisions stating how owners or operators of flares shall monitor these control devices.

43. The Respondent is also required to comply with 40 C.F.R. Part 60, Subpart A (General Provisions).

44. 40 C.F.R. § 60.11(d) in Subpart A requires that Respondent “to the extent practicable maintain and operate any affected facility including associated pollution control equipment in a manner consistent with good air pollution control practices for minimizing emissions.”

45. 40 C.F.R. § 60.18(d) in Subpart A requires Respondent to monitor its flares to assure they are operated and maintained in conformance with their design. 40 C.F.R. § 63.11(b) in Subpart A of the NESHAP and 40 C.F.R. § 60.18(d) in Subpart A of the NSPS state that owners or operators of flares shall monitor their air pollution control devices to ensure that they are operated and maintained in conformance with their designs. Applicable subparts will provide provisions stating how owners or operators of flares shall monitor these control devices

46. At the Facility, from August 9, 2011, to August 12, 2011, the steam to gas ratio exceeded ten (10) pounds of steam per pound of gas on numerous hourly occasions at Flare-1.

47. As a result of this operational practice at the site, the Respondent failed to operate Flare-1 in accordance with its design requirements, and in a manner consistent with good pollution control practices, and has therefore violated 40 C.F.R. §§ 60.11(d), 60.18(d), and 63.11(b).

## V. DENIALS

48. Respondent neither admits nor denies the specific factual allegations contained in the Alleged Violation Section IV of this CAFO.

## **VI. CIVIL PENALTY, COMPLIANCE ORDER, AND ADDITIONAL TERMS OF SETTLEMENT**

### **A. Civil Penalty**

49. For the reasons set forth above, Respondent has agreed to pay a civil penalty which has been determined in accordance with Section 113(d) of the CAA, 42 U.S.C. § 7413(d), which authorizes EPA to assess a civil penalty of up to twenty-five thousand dollars (\$25,000)<sup>2</sup> per day for each violation of the CAA. Upon consideration of the entire record herein, which is hereby adopted and made a part hereof, and upon consideration of the size of the business, the economic impact of the penalty on the business, the violator's full compliance history and good faith efforts to comply, the duration of the alleged violation, payment by the violator of penalties previously assessed for the same alleged violation, the economic benefit of noncompliance, the seriousness of the alleged violation, specific facts and equities, litigation risks, and other factors as justice may require, including Respondent's agreement to perform the additional terms of settlement set forth below, it is ORDERED that Respondent be assessed a civil penalty in the amount of Forty Five thousand dollars (\$45,000.00).

50. Within thirty (30) days of Respondent's receipt of this fully executed CAFO, Respondent shall pay Forty Five thousand (\$45,000.00) by cashier's, certified, or company check made payable to "Treasurer, United States of America, EPA - Region 6." Payment shall be

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<sup>2</sup> The Civil Penalty Inflation Adjustment Act of 1990, 28 U.S.C. § 2461, as amended by 31 U.S.C. § 3701 provides for increases in the statutory penalty provisions (\$25,000) cited in the Clean Air Act Stationary Source Civil Penalty Policy dated October 25, 1991 (CAA Penalty Policy). It provides for up to \$25,000 per day of violation for violations occurring on or before January 30, 1997; up to \$27,500 per day for each such violation occurring after January 30, 1997 through March 15, 2004; up to \$32,500 per day for each such violation occurring after March 15, 2004 through January 12, 2009; and up to \$37,500 per day for each such violation occurring after January 12, 2009.

remitted in one of five (5) ways: (1) regular U.S. Postal Service mail, to include certified mail; (2) overnight mail; (3) wire transfer; (4) Automated Clearinghouse; 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, the check(s) should be remitted to:

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

For overnight mail (non-U.S. Postal Service, e.g. Fed Ex), the check(s) 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  
(314) 418-4087

For wire transfer, the payment should be remitted to:

Federal Reserve Bank of New York  
ABA: 021030004  
Account: 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 [ACH] (also known as REX or remittance express)

Automated Clearing House (ACH) for receiving US currency  
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 or John Schmed, (202)874-7026 or REX, (866) 234-5681

For On-line Payment:

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

PLEASE

NOTE: Docket Number CAA-06-2012-3320 shall be clearly typed on the check to ensure proper credit. The check shall also be accompanied by a transmittal letter and shall reference Respondent's name and address, the case name, and docket number of the administrative complaint and CAFO. Respondent's adherence to this request will ensure proper credit is given when penalties are received for the Region. Respondent shall also send a simultaneous notice of such payment, including a copy of the money order, or check, and transmittal letter to the following:

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

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

51. Respondent agrees not to claim a federal income tax deduction or credit covering all or any part of the civil penalty paid to the United States Treasurer.

52. Pursuant to 31 U.S.C. § 3717 and 40 C.F.R. § 13.11, unless otherwise prohibited by law, EPA will assess interest and late payment penalties on outstanding debts owed to the United States and a charge to cover the costs of processing and handling a delinquent claim. Interest on the civil penalty assessed in this CAFO will begin to accrue thirty (30) days after the effective date of the CAFO and will be recovered by EPA on any amount of the civil penalty that is not paid by the respective due date. Interest will be assessed at the rate of the United States Treasury tax and loan rate in accordance with 40 C.F.R. § 13.11(a). Moreover, the costs of the Agency's administrative handling of overdue debts will be charged and assessed monthly throughout the period the debt is overdue. *See* 40 C.F.R. § 13.11(b).

53. EPA will also assess a fifteen dollar (\$15.00) administrative handling charge for administrative costs on unpaid penalties for the first thirty (30) day period after the payment is due and an additional fifteen dollars (\$15.00) for each subsequent thirty (30) day period that the penalty remains unpaid. In addition, a penalty charge of up to six percent per year will be assessed monthly on any portion of the debt which remains delinquent more than ninety (90) days. *See* 40 C.F.R. § 13.11(c). Should a penalty charge on the debt be required, it shall accrue from the first day payment is delinquent. *See* 31 C.F.R. § 901.9(d). Other penalties for failure to make a payment may also apply.

54. Pursuant to Section 113(d)(5) of the CAA, 42 U.S.C. § 7413(d)(5), any person who fails to pay on a timely basis a civil penalty ordered or assessed under this section shall be required to pay, in addition to such penalty and interest, the United States enforcement expenses, including, but not limited to, attorneys fees and costs incurred by the United States for collection proceedings, and a quarterly nonpayment penalty for each quarter during which such failure to pay persists. Such nonpayment penalty shall be 10 percent of aggregate amount of such person's outstanding penalties and nonpayment penalties accrued as of the beginning of each quarter.

#### **B. Compliance Order**

55. Within twelve (12) months of the effective date of this CAFO, Respondent shall have completed the additional terms of settlement set forth in Paragraphs 56 through 61.

#### **C. Additional Terms of Settlement**

56. Respondent shall complete the installation of modifications to the steam flow meter system on Flare-1 as set forth in this paragraph. The steam flow meter system shall:

- A. Continuously measure the total flow, in standard cubic feet per minute (scfm) or pounds per hour (lbs/hour), of all steam used at the flare;

- B. Be able to produce and record data measurements for steam flow averages no less than once every fifteen (15) minutes;
- C. Meet or exceed the specifications of steam flow measurement repeatability of  $\pm 1\%$  of reading over the range of the instrument, and accuracy within 2% for 100-6% of span and 3% for 6-4% of span;
- D. Be installed to be applicable to AGA, ANSI, API, or equivalent standard;
- E. Be corrected so that the flow is one atmosphere pressure and 68 °F; and
- F. Continuously analyze the pressure and temperature of the steam at each point of measurement.

57. Respondent shall complete the installation of modifications to the steam control system on Flare-1 as set forth in this paragraph. The steam control system shall include equipment, controls, and instrumentation, as necessary, to enable Respondent to automate the control of total steam flow in a manner sufficient to conduct the Demonstration project in accordance with Paragraph 58. The automatic control shall use programming logic to automate the operation of the flare instrumentation systems so as to produce the operational results required during the Demonstration project.

58. For a period of thirty (30) calendar days, Respondent will operate the Flare-1 for a Demonstration project as set forth in this paragraph. During the Demonstration project, Respondent shall:

- A. Calculate the Combustion Zone Net Heating Value ( $NHV_{CZ}$ ) and Combustion Zone Net Heating Value Limit ( $NHV_{CZ-limit}$ ),
  - i. No less than once every fifteen (15) minutes,

- ii. In accordance with all relevant equations, constants and variables provided in the Appendix,
  - iii. Where  $NIIV_{CZ}$  is the calculated heating value of the mixture of all gases and vapors (including vent gas, pilot gas, and steam), found just after the flare tip.
- B. For the purposes of calculations, Vent Gas shall mean all gas found just prior to the flare tip, including waste gas, sweep gas, purge gas, and supplemental gas but does not include pilot gas, steam, or any assist air;
- C. Except as provided in Paragraph 61, continuously operate Flare-1 so as to ensure that the Combustion Zone Net Heating Value ( $NHV_{CZ}$ ) is greater than or equal to the Combustion Zone Net Heating Value Limit ( $NIIV_{CZ-limit}$ ), on a 3-hour rolling average basis;
- D. Calculate heating value one-hour block average values such that they shall be an average of the interim values (no less than once every 15 minutes). Any instance where flow in the flare is zero over an interim period shall constitute 'no flow' and the interim heating value shall be assigned a value of zero. Beginning at 12:01 AM of each calendar day, calculate a heating value one-hour block average by dividing the sum of the non-zero interim values by the number of non-zero interim values in that first hour of the day. Repeat this process, to calculate each subsequent one-hour block average of non-zero interim heating values.
- E. Record hourly averages of: Total Steam Flow (in lbs/hour), Vent Gas Flow (in lbs/hour), Vent Gas Net Heating Value (in British Thermal Unit per



standard cubic feet, BTU/scf), Combustion Zone Net Heating Value ( $NHV_{CZ}$ , in BTU/scf), and Combustion Zone Net Heating Value Limit (in BTU/scf);

- F. Record any excepted activity discussed in Paragraph 61 and manual override of the Flare-1 steam control system that occurs, including the date, time, duration, reason for the override or excepted activity, and corrective actions the Respondent took.

59. The Respondent shall provide a certification to both of the EPA Region 6 contacts listed in Paragraph 50, via certified mail return receipt requested, that the system, equipment, and controls required by Paragraphs 56 and 57 were installed, and the Demonstration project was successfully conducted and completed in accordance with the requirements of Paragraph 61.

60. The certification referenced in Paragraph 59 shall be signed by a responsible corporate official and 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 all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment.

61. During the Demonstration project, the Respondent shall continuously operate Flare-1 as specified in Paragraph 58 except for periods of instrument malfunction and quality assurance/quality control activities, provided however, that in no event shall the total of these excepted activities exceed 5% of the project duration. If these excepted activities exceed 5% of the project duration, the Demonstration project shall be repeated in its entirety. Nothing in this paragraph is intended to prevent the Respondent from claiming a *force majeure* defense to any period of instrumentation or monitoring system downtime.

62. Respondent shall retain for a period of five years after termination of this CAFO all records created pursuant to this CAFO, including the raw data values and shall make any such documents available to EPA upon request.

63. Nothing in this agreement shall be construed as prohibiting, altering, or in any way limiting the ability of EPA to seek any other remedies or sanctions available by virtue of the Respondent's violation of this agreement or of the statutes and regulations upon which this agreement is based, or for the Respondent's violation of any applicable provision of law.

64. This CAFO shall not relieve the Respondent of its obligation to comply with all applicable provisions of federal, state or local law, nor shall it be construed to be a ruling on, or determination of, any issue related to any federal, state or local permit, nor shall it be construed to constitute EPA approval of any equipment or technology installed by the Respondent in connection with any additional settlement terms undertaken pursuant to this CAFO. Nothing in this CAFO shall be construed to prohibit or prevent the federal, state, or local government from developing, implementing, and enforcing more stringent standards through rulemaking, the permit process, or as otherwise authorized or required.

65. This document is a "Final Order" as that term is defined in the CAA Penalty Policy for the purpose of demonstrating a history of "prior such violations."

## **VII. RETENTION OF ENFORCEMENT RIGHTS**

66. EPA does not waive any rights or remedies available to EPA for any violations by the Respondent of any other Federal laws, regulations, statutes, or permitting programs not the subject of this action.

67. Nothing in this CAFO shall relieve Respondent of the duty to comply with all applicable provisions of the CAA related to operation of Flare-1 prior to the effective date of this CAFO.

68. In consideration of Respondent's completion of the obligations under this CAFO and subject to the limitations and conditions set forth in this CAFO, EPA releases and covenants not to sue Respondent, with respect to the alleged violations listed in paragraphs 37 through 47 associated with Flare 1 prior to the effective date of this CAFO.

#### **VIII. COSTS**

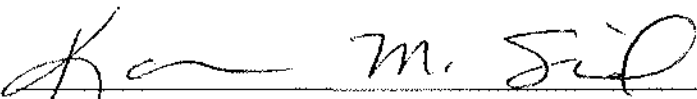
69. Each party shall bear its own costs and attorneys fees.

#### **IX. TERMINATION**

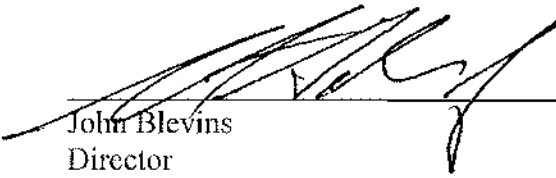
70. This CAFO shall automatically terminate after the Respondent satisfies all requirements. The requirements for termination include payment of all penalties that are due to the United States, compliance with all CAFO requirements, and EPA's receipt of the Respondent's certification discussed in Paragraphs 59 and 60.

IT IS SO AGREED:

FOR THE RESPONDENT:

Date: 7-25-2012   
Karen M. Swindler  
Senior Vice President  
Manufacturing Americas

FOR THE COMPLAINANT:

Date: JUL 30 2012   
John Blevins  
Director  
Compliance Assurance and  
Enforcement Division

**FINAL ORDER**

Pursuant to Section 113(d) of the CAA, 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 foregoing Consent Agreement is hereby ratified. This Final Order shall not in any case affect the right of EPA or the United States to pursue appropriate injunctive or other equitable relief or criminal sanctions for any alleged violations of law. This Final Order shall resolve only those causes of action alleged in this CAFO. The successful completion of the additional terms of settlement set forth in Paragraphs 56 through 61 and the Appendix to this CAFO are conditions precedent to the resolution of the claims set forth in Paragraphs 37 through 47 of this CAFO. Nothing in this Final Order shall be construed to waive, extinguish, or otherwise affect Respondent's (or its officers, agents, servants, employees, successors, or assigns) obligation to comply with all applicable federal, state, and local statutes and regulations, including the regulations that were the subject of this action. The Respondent is ordered to comply with the terms of settlement as they relate to the assessment of civil penalties and the requirement to perform additional terms of settlement. In accordance with 40 C.F.R. § 22.31(b), this Final Order shall become effective upon filing with the Regional Hearing Clerk.

Dated Aug. 7, 2012



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Patrick Rankin  
Regional Judicial Officer  
U.S. EPA, Region 6

## Appendix

### CALCULATING $NHV_{cz-limit}$ AND $NHV_{cz}$ FOR STEAM-ASSISTED FLARES

All abbreviations, constants, and variables are defined in the Key at the end of this Appendix.

#### Steps in the Calculations

##### Step 1: Determine the Lower Flammability Limit (“LFL”) of Each Individual Vent Gas Compound

Take the LFL values of each individual Vent Gas compound from Table 1 in this Appendix.

##### Step 2: Calculate the LFL of the vent gas mixture

The average lower flammability limit of the vent gas is calculated by Le Chatelier’s equation shown below as Equation 1. This calculation uses the weighted average of the LFLs of the individual compounds weighted by their volume percent of the vent gas. All inerts, including nitrogen, are assumed to have an infinite lower flammability limit (e.g.  $LFL_{N_2} = \infty$ ).

$$LFL_{vg} = \frac{1}{\sum_{i=1}^n \left( \frac{x_i}{LFL_i} \right)} \quad \text{Equation 1}$$

##### Step 3: Determine the Net Heating Value of the Vent Gas ( $NHV_{vg}$ )

**If a Gas Chromatograph is used:** The net heating value of the vent gas is calculated and reported from the GC at the conclusion of each analytical cycle (~10-15 minutes). Equation 2 is used by the GC to calculate the vent gas net heating value from each individual compound net heating value. Individual compound volume fractions are measured directly by the GC. Individual compound net heating values are listed in Table 1 of this Appendix.

$$NHV_{vg} = \sum_{i=1}^n (x_i \cdot NHV_i) \quad \text{Equation 2}$$

**If a Net Heating Value Analyzer/Calculator is used:** Use the measured value.

##### Step 4: Calculate the $NHV_{vg}$ at its LFL ( $NHV_{vg-LFL}$ )

Using  $LFL_{vg}$  from Equation 1 and  $NHV_{vg}$  from Equation 2, the  $NHV_{vg-LFL}$  is calculated by Equation 3.

$$NHV_{vg-LFL} = NHV_{vg} \cdot LFL_{vg} \quad \text{Equation 3}$$

**Step 5: Multiply  $NHV_{vg-LFL}$  by the Combustion Efficiency Multiplier to calculate the  $NHV_{cz-limit}$**

The Net Heating Value of the Gases in the Combustion Zone ( $NHV_{cz}$ ) of a Flare that is needed to ensure an acceptable Combustion Efficiency is determined by multiplying  $NHV_{vg-LFL}$  by Combustion Efficiency Multipliers as defined in Table 2. The Net Heating Value of Combustion Zone Gas Limit is calculated as follows:

$$NHV_{cz-limit} = (A) \cdot NHV_{vg-LFL} \quad \text{Equation 4}$$

**Step 6: Calculate the Net Heating Value of the Combustion Zone Gas ( $NHV_{cz}$ )**

The  $NHV$  in the combustion zone ( $NHV_{cz}$ ) combines the  $NHVs$  of the Vent Gas, pilot gas, and steam and is calculated by Equation 5. The  $NHV$  of steam is assumed to be zero. Vent Gas mass flow rate ( $\dot{m}_{vg}$ ) and steam mass flow rate ( $\dot{m}_s$ ) are measured by on-line flow meters. The pilot gas mass flow rate ( $\dot{m}_{pg}$ ) is constant for each flare and set by an orifice.

$$NHV_{cz} = \frac{\left(\frac{\dot{m}_{vg} \cdot NHV_{vg}}{MW_{vg}}\right) + \left(\frac{\dot{m}_{pg} \cdot NHV_{pg}}{MW_{pg}}\right)}{\left(\frac{\dot{m}_{vg}}{MW_{vg}}\right) + \left(\frac{\dot{m}_{pg}}{MW_{pg}}\right) + \left(\frac{\dot{m}_s}{MW_{H_2O}}\right) + \left(\frac{\dot{m}_{air}}{MW_{air}}\right)} \quad \text{Equation 5}$$

The values for  $\dot{m}_s$  and  $\dot{m}_{air}$  are determined as follows based on the type of flare:

**Steam-Assisted Flare without a Minimum Steam Reduction System (“MSRS”)**

$\dot{m}_s = \text{measured value}$

$\dot{m}_{air} = 0$

**Steam-Assisted Flare with MSRS**

$\dot{m}_s = \text{measured value}$

$\dot{m}_{air} = \text{result from Equation 13 in Step 6a}$

OR

$\dot{m}_{air} = 0$  with vendor certification that the MSRS equipment installed on the flare is not capable (even at minimum vent gas flow) of inspirating more than twice the stoichiometric volume of air into the vent gas.

The molecular weight of the vent gas ( $MW_{vg}$ ) is calculated by the GC using Equation 6. An on-line ultrasonic flow meter may also be used to calculate  $MW_{vg}$ . Individual compound molecular weights are listed in Table 1 of this Appendix.

$$MW_{vg} = \sum_{i=1}^n (x_i \cdot MW_i) \quad \text{Equation 6}$$

The  $NHV$  of the pilot gas ( $NHIV_{pg}$ ) and  $MW$  of the pilot gas ( $MW_{pg}$ ) are calculated using Equations 7 and 8, respectively. These calculations are similar to the vent gas calculations, except the individual compound volume fractions are that of the pilot gas and not the vent gas. Individual compound volume fractions are measured by laboratory analysis of a pilot gas sample, or may be taken from the natural gas supplier’s laboratory certificate of analysis.

$$NHV_{pg} = \sum_{i=1}^n (pg_i \cdot NHV_i) \quad \text{Equation 7}$$

$$MW_{pg} = \sum_{i=1}^n (pg_i \cdot MW_i) \quad \text{Equation 8}$$

**Step 6a:** Calculation of air mass flow rate for flares equipped with MSRS. *Equations 9-13* not applicable

**Step 7:** Ensure that during flare operation,  $NHV_{cz} \geq NHV_{cz-limit}$

The flare must be operated to ensure that  $NHV_{cz}$  is equal to or above  $NHV_{cz-limit}$  to ensure an acceptable combustion efficiency. Equation 14 shows this relationship.

$$NHV_{cz} \geq NHV_{cz-limit} \quad \text{Equation 14}$$

**Key to the Abbreviations:**

- 0.21 = mole fraction of oxygen in air (0.21 lb-mol O<sub>2</sub>/lb-mol air)
- A = overall combustion efficiency multiplier for  $NHV_{vg-LFL}$  (unitless)
- C<sub>vg</sub> = concentration of VOC in the vent gas (vol %)
- i = individual numbered compound from column i in Table 1 (unitless)
- j = individual numbered compound from column j in Table 1 (unitless)
- LFL<sub>i</sub> = lower flammability limit of individual compound (vol %)
- LFL<sub>vg</sub> = lower flammability limit of vent gas (vol %)
- m<sub>air</sub> = mass flow rate of air (lb/hr)
- m<sub>pg</sub> = mass flow rate of pilot gas (lb/hr)
- m<sub>s</sub> = mass flow rate of total steam (lb/hr)
- m<sub>vg</sub> = mass flow rate of vent gas (lb/hr)
- MW<sub>H<sub>2</sub>O</sub> = molecular weight of water (18.02 lb/lb-mol)
- MW<sub>O<sub>2</sub></sub> = molecular weight of oxygen (32.0 lb/lb-mol)
- MW<sub>air</sub> = molecular weight of air (28.9 lb/lb-mol)
- MW<sub>pg</sub> = molecular weight of pilot gas (lb/lb-mol)
- MW<sub>vg</sub> = molecular weight of vent gas (lb/lb-mol)
- n = list of individual compounds from Table 1 (unitless)
- NHV<sub>cz</sub> = net heating value of the combustion zone (BTU/scf)
- NHV<sub>i</sub> = net heating value of individual compound (BTU/scf)
- NHV<sub>vg-LFL</sub> = net heating value vent gas at lower flammability limit (BTU/scf)
- NHV<sub>cz-limit</sub> = limit net heating value of the combustion zone (BTU/scf)
- NHV<sub>pg</sub> = net heating value of pilot gas (BTU/scf)
- NHV<sub>vg</sub> = net heating value of vent gas (BTU/scf)
- pg<sub>i</sub> = individual compound volume fraction in pilot gas (vol fraction)
- x<sub>i</sub> = individual compound volume fraction in the vent gas (vol fraction)
- x<sub>j</sub> = individual combustible compound volume fraction in the vent gas (vol fraction)



**Table 1**  
**Individual Compound Properties**

<i>i</i>	<i>j</i>	Compound	NHV <sub><i>i</i></sub> (Btu/scf)	MW <sub><i>i</i></sub> (lb/lbmol)	LFL <sub><i>i</i></sub> (vol fraction)
1	1	Hydrogen	274	2.02	0.040
2		Oxygen	0	32.00	∞
3		Nitrogen	0	28.01	∞
4		CO <sub>2</sub>	0	44.01	∞
5		Water	0	18.02	∞
6		CO	316	28.01	0.125
7	2	Methane	896	16.04	0.050
8	3	Ethane	1595	30.07	0.030
9	4	Ethylene	1477	28.05	0.027
10	5	Acetylene	1404	26.04	0.025
11	6	Propane	2281	44.10	0.021
12	7	Propylene	2150	42.08	0.024
13	8	iso-Butane	2957	58.12	0.018
14	9	n-Butane	2968	58.12	0.018
15	10	iso-Butene	2928	56.11	0.018
16	11	trans-Butene	2826	56.11	0.017
17	12	cis-Butene	2830	56.11	0.016
18	13	1,3-Butadiene	2690	54.09	0.020
19	14	Pentane+ (C <sub>5</sub> +) )	3655	72.15	0.014
20	15	Benzene	3591	78.11	0.013

Note: *i*=all compounds, *j*=organic compounds and hydrogen

**Table 2**  
**Combustion Efficiency Multipliers for Steam-Assisted Flares:**  
**Variables Based on Minimum Steam Requirements**  
**and VOC Concentration in the Vent Gas**

Minimum Steam	VOC Vent Gas Concentration	A Multiplier
≤ 1000 lb/hr	< 20.0%	6.0
≤ 1000 lb/hr	> 20.0%	6.5
> 1000 lb/hr	≤ 20.0%	6.75
> 1000 lb/hr	> 20.0%	7.0

The “VOC Vent Gas Concentration” shall be calculated on an annual average basis as follows:

$$C_{vg} = \sum_{j=4}^n x_j * 100 \tag{Equation 16}$$

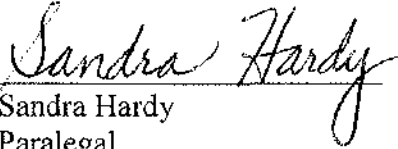
Note: The summation does not include methane or ethane.

CERTIFICATE OF SERVICE

I hereby certify that on the 7th day of August, 2012, the original and one copy of the foregoing Complaint, Compliance Order, and Consent Agreement and Final Order ("Complaint, Compliance Order, and CAFO") 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 # 7010 2780 0002 4356 4443

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