HW → 1995.03.14 LGF Feed Rate Test Protocol

Norlite Corporation

Norlite

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March 14, 1995

WJZ-071-95

William J. Clarke
Regional Permit Administrator
New York State Department of
Environmental Conservation
Region 4
1150 N. Westcott Road
Schenectady, New York 12306-2014

RE: Test Protocol to Validate Higher LGF Halogen Feed Rate Limit

Dear Mr. Clarke:

As discussed at our meeting of March 2, 1995, Norlite is submitting with this letter a revised Test Protocol to evaluate the impact of a higher halogen feed rate limit for LGF on the stack emission characteristics. This protocol has been revised from the version last submitted in December 1994 to incorporate various tests that will evaluate the impact of scrubber water blowdown rate on stack emissions. In addition, the halogen feed rate will be varied. Also, a plan to test scrubber water samples for ammonia nitrogen has been added, to ensure that the higher halogen feed rate will not impact the capability of the wastewater treatment plant to manage the scrubber water to SPDES Permit standards.

Norlite is proposing to conduct this test starting April 10th. As discussed at our March 2nd meeting, maintenance outages are planned for each kiln in April and May. This will enable the scrubber blowdown rate to be increased to 30 gpm from the one kiln that is operating, thereby allowing wastewater treatment operation equivalent to the hydraulic capacity of the permanent system. Proceeding with these tests in April and May will enable many technical questions to be addressed regarding the proposed halogen permit modification.

If you have any questions on the attached Test Protocol, please feel free to call either me or Bill Klein. Thank you for your assistance in this matter.

Sincerely,

William J. Ziegler
Vice President of Health, Safety,
and Environmental Affairs

WJZ:ncm
Attachment

cc: Sanjay Saraiya, NYSDEC Region 4
Robert Warland, NYSDEC Region 4
Bill Klein, Norlite
Ed Burgher, Norlite
Chuck Vannoy, Norlite
Dennis Venters, Norlite
Richard Schlauch, Norlite
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TEST PROTOCOL FOR DEMONSTRATING COMPLIANT STACK PLUME CHARACTERISTICS WHILE FIRING WASTES CONTAINING CHLORINATED ORGANICS IN EXCESS OF CURRENT PERMIT FEED LIMITS

MARCH 13, 1995

REVISION #1

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TEST PROTOCOL FOR
DEMONSTRATING COMPLIANT STACK PLUME CHARACTERISTICS
WHILE FIRING WASTES CONTAINING CHLORINATED ORGANICS
IN EXCESS OF CURRENT PERMIT LIMITS

1.0 INTRODUCTION

Norlite Corporation, located in Cohoes, New York, operates two lightweight aggregate kilns that incinerate both liquid and solid hazardous wastes/low grade fuels (LGF) for destruction and energy recovery. Emissions from these processes are controlled by independent air pollution control systems, each consisting principally of a baghouse and wet scrubber.

During September/October 1992, Norlite conducted a Trial Burn on Kiln #1. This Trial Burn successfully demonstrated that Kiln #1's air pollution control system is capable of removing hydrogen chloride from flue gases to within regulated State and Federal emissions limits while the kiln is fired with hazardous waste fuels containing up to 440 lbs./hr. of organic chlorine. Since Kiln #2's air pollution control system is identical to that of Kiln #1, the Trial Burn also demonstrated Kiln #2's capability to satisfy emissions limits for hydrogen chloride under similar conditions. Results of the Trial Burn were incorporated into a comprehensive Trial Burn Report which was submitted to the New York State Department of Environmental Conservation (DEC) during December 1992. While DEC was reviewing Trial Burn results pursuant to issuing revised permit conditions, Norlite requested DEC to authorize testing of a zero (wastewater) discharge system which, if successful, would entirely eliminate wastewater discharges from the facility. For a variety of reasons, zero discharge proved to be unfeasible. These reasons were mainly attributed to build-up of solids in the APC system. During the zero discharge test, DEC received an odor complaint from a local resident. This complaint, in conjunction with the presence of a trailing plume during the zero discharge test period, prompted DEC to propose, as a minor modification, authorization of a 30 day test. During the test period, Norlite would demonstrate that there are no adverse changes to stack plume characteristics associated with firing chlorinated organics at levels significantly in excess of the current 115 lbs./hr. permit limit. This test period will confirm that the odor complaint and trailing plume was solely the result of the zero discharge process, and not expected from routine operation at levels of chlorine feed of 440 lbs/hr.

The objective of this protocol is to define the manner in which such a test will be conducted. By testing both kilns at elevated organic chlorine feed rates for a 30 day period, Norlite expects to demonstrate compliant and acceptable stack plume characteristics under worst case circumstances for a wide range of meteorological conditions. The test will demonstrate the ability of Norlite's air pollution systems to properly control hydrogen chloride emissions at organic chlorine feed rates significantly in excess of currently permitted values, and will support a revised permit condition for burning wastes with elevated chlorine levels. Prior stack tests in 1992 have demonstrated the ability of the kiln process to meet New York Part 373 and EPA Part 266 standards when feeding chlorine at average rates of 440 lbs/hr.

The test will also evaluate the impact of various scrubber water blowdown rates on the stack plume characteristics. It is believed that the adverse plume characteristics observed during the zero discharge test period were due to low blowdown rates for the scrubber water. The objective of zero discharge process operations was to minimize blowdown rate so as to minimize the amount of water injected into the kiln. These blowdown rates were as low as 5 gpm. It is believed that the higher the blowdown rate, the better the scrubbing efficiency and the better the quality of plume characteristics. This test will verify this.

Data and observations collected during this test will be evaluated and summarized in a report to be submitted to DEC within 45 days following completion of testing. Refer to Section 5.0 for a description of the report format and content.

2.0 **PROJECT ORGANIZATION**

Mr. William J. Klein, Director of Compliance, will be responsible for management of the test program and compilation of all test data and conclusions into a comprehensive test report. Waste fuel activities and routine plant operations will be under the direction of Mr. Donald V. Seauvageau, Production Manager. Finally, stack plume observations, chlorine emissions monitoring, and stack flow rate measurements will be managed by Mr. Edward Burgher, Director of Permitting.

3.0 TEST IMPLEMENTATION

3.1 Overview

Norlite proposes to conduct the subject elevated chlorine feed test on both kilns for a net 30 day period. Appropriate waste feeds will be prepared by enriching the organic chlorine content of routine waste feeds by blending with chlorinated POHCs or by using as-received waste and blending to a higher percentage chlorine, on the order of 9%. Each kiln will be operated separately at maximum permitted feed conditions and air pollution control systems will be operated in accordance with current permit limits to achieve the appropriate levels of chlorine removal. Stack plume characteristics for both units, specifically the presence of trail-off/opacity and, where possible, odor at the point the plumes touch the ground will be observed and recorded at specified intervals for the duration of the test. In addition, a chlorine emissions monitor will be installed to continuously monitor chlorine emissions from each kiln during each separate test period. Finally, daily samples of the scrubber blowdown water will be collected for analysis for ammonia nitrogen, to determine if there is a potential for impact to the treatability of the scrubber water and final effluent quality.

3.2 Theory

During the 1992 Trial Burn, the cause of the trailing plume affect was demonstrated to be ammonium chloride. Ammonium chloride forms sub-micron particulate with crystals of high refractive index, creating an apparent elevated opacity. Despite this effect, the emissions of HCl were in compliance with Part 373 Limits during the Trial Burn.

The Zero Discharge Testing performed in 1993 involved the use of the scrubber blowdown as a temperature control agent in the kiln. All of the scrubber blowdown was injected into the kiln. For this reason, the main objective of the zero discharge process was to minimize the volumetric rate of blowdown, to the range of 5 to 10 gpm. When this was done, it was observed that the apparent opacity of the plume increased, and the removal efficiency for HCl declined. Odors of acid gas were experienced at the point at which the plume impacted ground level during a one day test during which halogen feed rates of 440 lbs/hr were made to Kiln 2.

The Trial Burn in 1992 operated at high halogen feed rates for 6 days with no exceedence of Part 373 Limits for HCl, and with good plume characteristics. The reason is believed to be attributed to the high scrubber blowdown rates, with minimum rates averaging 28 to 30 gpm. These higher blowdown rates result in higher fresh make-up water rates, and lower dissolved solids in the scrubber water. This in turn improves scrubber efficiency for HCl, and removal efficiency for submicron particulate matter like ammonium chloride.

3.3 Test Execution

Prior to the start of the test period, Norlite will conduct background evaluations of the plume characteristics under current conditions of blowdown rates of 10 to 12 gpm, and halogen feed rates of 115 lbs/hour. Two days of data will be collected for each kiln to establish background. Samples of the scrubber blowdown will be analyzed for ammonia nitrogen, to evaluate the current impact on wastewater treatment. These background evaluations will be conducted April 10th to April 14th.

Each kiln is scheduled for a two week shutdown, with Kiln #2 going down for two weeks (April 24th to May 6th) and Kiln #1 going down for two weeks in May (May 10th to May 24th). During the time that one kiln is down, the hydraulic capacity of the temporary wastewater treatment plant is such that a blowdown rate of 30 gpm can be sustained for the one operating kiln. This will enable Norlite to complete testing in April and May, so that the halogen major permit modification can be evaluated and completed in time for completion of the permanent wastewater treatment plant in October.

Norlite proposes to evaluate plume characteristics under varying halogen feed rates and scrubber blowdown characteristics. This will enable evaluation of the relationship between parameters such as HCl emission rate, opacity, and scrubber water ammonia nitrogen content versus scrubber water blowdown rate and halogen feed rate. Halogen feed rates of 115, 200, 250, 300 and 440 lbs/hour will be evaluated, against scrubber blowdown rates of 10, 20 and 28 gpm. These parameter may vary by 10% from these proposed values. These various blowdown rates and halogen feed rates will provide sufficient data to allow the establishment of permit conditions that maximize halogen feed rate while maintaining compliant emissions.

3.4 Test Schedule

The background measurements will be taken for two days on each kiln at existing blowdown rates and halogen feed rates of 115 lbs/hour. This will be conducted the week of April 10th. Then the 30 day test period of higher halogen feed rates will be initiated.

The following table provides the schedule for conducting the test on each kiln. This schedule allows all critical combinations of scrubber blowdown rate and halogen feed rate to be evaluated on each kiln.

TEST SCHEDULE

Day	Kiln	Scrubber Blowdown Rate (gpm)	Halogen Feed Rate lbs/hr
	Pre Shutdown Tests on both Kilns (April 18-21)		
1	1&2	10-12	200
2	1&2	10-12	250
3	1&2	10-12	300
4	1&2	10-12	440
	April Shutdown Kiln #2 (April 24 - May 6)		
5	1	28	200
6	1	20	250
7	1	20	250
8	1	28	250
9	1	28	250
10	1	20	300
11	1	20	300
12	1	28	300
13	1	28	300
14	1	20	440
15	1	20	440
16	1	28	440
17	1	28	440
	May Shutdown Kiln #1 (May 10 - May 24)		
18	2	28	200
19	2	20	250
20	2	20	250
21	2	28	250
22	2	28	250
23	2	20	300
24	2	20	300
25	2	28	300
26	2	28	300
27	2	20	440
28	2	20	440
29	2	28	440
30	2	28	440

In the table above, the four days of higher halogen feed at the low blowdown rates will be performed prior to the scheduled maintenance outage on each kiln. Since the blowdown required for each of these four days is achievable with the temporary wastewater treatment plant, these four days can be completed prior to the shutdown schedule. The higher blowdown rates will then be evaluated on each kiln during each 14 day maintenance outage.

In the event that some unexpected process limit is prematurely reached, Norlite will evaluate the cause and, at its option, elect to correct the problem and then proceed with the test program or continue the 30 day test at some reduced chlorine feed limit.

3.5 Process Configuration

The kilns and their associated air pollution control systems are configured in accordance with the description contained in Section 3.2 of the Trial Burn Report. The only substantial difference between the configuration of the current kiln systems and those at the time of the Trial Burn, concerns the treatment and disposition of wastewater (scrubber blowdown). During the Trial Burn for Kiln #1, scrubber blowdown was discharged to the Salt Kill consistent with interim control measures which were established as part of an engineering report approved by DEC. Norlite has since installed a temporary wastewater treatment system capable of treating up to 15 gpm of blowdown per kiln. The permanent wastewater system will be capable of managing an average 30 gpm blowdown per kiln.

3.6 Waste Preparation

During the 30 day test, routine sources of LGF will be enriched in organic chlorine content by blending with POHCs in the waste storage/feed system or by using received wastes. The POHC source will be a non-hazardous mixture of tri and tetrachlorobenzenes which have a nominal chlorine concentration of 60%. All other aspects of waste acceptance and feed preparation/planning will be in accordance with current approved permit conditions and practices. Further details on the POHC spike are presented in Appendix B.

Non-hazardous POHC blends will be received in tank car or drum quantities. Tank cars will be off-loaded in a manner similar to hazardous waste receipts, except that only that quantity of POHC necessary to prepare a waste blend will be withdrawn from the tanker at a given time. In this manner, tankers will be partially off-loaded and used for interim storage of non-hazardous POHCs. This arrangement is necessary since test related feed planning, blending, sampling, and LGF feed operations for two kilns, at maximum feed rates for sustained periods, will tax Norlite's storage/feed systems and analytical resources. Full and partially filled tankers of POHCs will be parked in the truck staging area which has secondary containment capability in the unlikely event of a leak.

3.7 Process Operations

During the 30 day test, the kilns and their air pollution control systems will be operated in accordance with the process limits defined in Norlite's Part 373 permit. Norlite expects DEC will grant written approval, via a minor modification, to allow an organic chlorine feed limit of 440 lbs./hr./kiln for the duration of the 30 day test.

The success of this test is dependent on the ability of Norlite's air pollution control systems to remove hydrogen chloride from flue gases and comply with established emissions limits while each kiln is taxed by operating at maximum permitted conditions. Feed conditions for each kiln will be as follows:

- LGF feed rate will be 10.1 gal./min./kiln with an organic chlorine concentration corresponding to a feed rate of up to 440 lbs./hr./kiln, and

- Raw shale feed rate will be 22 tons/hr./kiln.

To ensure optimum performance, i.e., maximum chlorine removal, the air pollution control systems will be operated as follows:

- Scrubber water will be recirculated at rates in excess of 175 gpm for each unit,

- Scrubber recirculation tank pH will be controlled in the range of 7.9 to 8.5 for each unit,

- Scrubber water blowdown will be varied from 10 to 30 gpm for each unit to establish the relationship between blowdown rate and stack plume characteristics, and

- A lime feed rate of 2.7 to 3.5 lbs./hr. will be maintained to each baghouse for each corresponding lb./hr. of organic chlorine contained in the waste feed.

All other process control parameters will be maintained within current permit limits or interim permit limits established by the minor modification authorizing this test.

3.8 Data Collection/Stack Plume Characterization

During the 30 day test periods, all routine LGF, kiln, and air pollution control system operating parameters will be recorded for both units in accordance with permit requirements and current practices. In addition, stack plume characteristics for both units, specifically the presence of-trail-off and opacity and, where possible, the absence/presence of acid gas-like odor at the point the plumes touch the ground will be observed and recorded at least one time per batch of waste or two times per (24 hour) day, whichever is more frequent. Meteorological conditions from site observations and local weather service broadcasts corresponding to the time of each plume characterization will also be logged. Whenever possible, stack plume observations will be made during periods of adverse meteorology.

On each day of the test, one grab sample of scrubber blowdown water will be collected for analysis of ammonia nitrogen. This grab sample will be collected towards the end of each day, to ensure that the equilibrium ammonia nitrogen concentration is at its highest.

Ammonia nitrogen will be determined in accordance with EPA Method 350.2 in "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020. These analyses will be performed by a New York certified laboratory.

If the results indicate significantly elevated ammonia nitrogen in scrubber water under the high halogen feed rate conditions, additional treatability studies will be performed to determine impact on discharge quality. A separate test program will be prepared for these treatability studies at this time.

In addition to the foregoing, continuous HCl emissions monitoring will be conducted in accordance with Section 4.0 and Appendix A.

4.0 <u>EMISSION TESTING</u>

4.1 Continuous HCl Emissions Monitoring

A continuous HCl emissions monitor will be used to measure HCl emissions from one kiln. Since both kilns will be operated with the same waste feed materials in (as close as possible to) identical fashions, HCl emissions from the second unit will be essentially identical.

Stack gases will be withdrawn from a stack test port with a sampling system consisting of a heated probe/filter enclosure, a heated sample line, a chloride analyzer, and a sample pump. Continuous gas stream analysis will be performed by the chloride analyzer, a TESS-COM Model 745 TGA, SN 1115HCL, Ambient Low Level Gaseous Chloride Analyzer. The theory of operation for this device is as follows:

> The gas sample is drawn through a glass scrubber by the sample pump. Sample flow is maintained at a constant rate by an orifice at the entrance to the scrubber. A positive displacement pump introduces a constant flow of a specially prepared scrub solution into the scrubber. The scrub solution (distilled water, nitric acid, and potassium nitrate) is buffered to maintain a constant ionic strength. As the gas stream is bubbled through the scrub solution, chloride ions are formed as HCl is removed from the gas stream. A second metering (positive displacement) pump extracts a liquid sample, at a constant rate, from the scrubber and delivers it through a debubbler to a chloride ion-selective (measuring) electrode which, along with a reference electrode, is contained in a temperature controlled (18 degrees Celsius) flow cell. The difference in potential between the two electrodes corresponds to the chloride ion concentration. Potential differential is then electronically amplified and converted to an output range of 4-20 mA. This output is measured and calibrated to a range of 0-100 ppm chlorine in the stack gas.

Further details on the HCl CEM system is provided in Appendix A. This measurement will provide a numerical value for chloride concentrations in stack gases. Since the stack gas sample contains no condensed moisture from its point of withdrawal (from the stack) up to the point it is introduced to the instrument's scrubber, HCl monitoring performed in this manner will be immune to the documented ammonium chloride interference which was encountered in Method 0050 testing during the 1992 Trial Burn.

To convert the aforementioned gas chloride concentration to an equivalent emission rate, a stack flow rate measurement will be taken in accordance with EPA Method 2 for each change in waste composition or waste feed rate which produces a 5% change in mass gas velocity as measured by induced draft fan current draw at a constant damper position. All changes in damper position will prompt taking a new stack flow rate measurement.

The HCl CEM system will not be operated 24 hours per day for the entire 30 day test period. The reason is the difficulty in maintaining this newly developed CEM operational for more than a 1 hour period. HCl CEMS are relatively new technology and have not been perfected to the extent of other CEM systems, such as CO analyzers. The CEM requires frequent maintenance and change out of the buffer solutions.

The HCl CEM system will therefore be operated for two 1 hour test periods each day of the 30 day test program. The 1 hour test periods will be continuously recorded to document readings obtained. The two 1 hour test periods will be randomly changed, so as not to occur at the same point in time each day.

4.2 Opacity

The opacity of the exhaust plume will be determined in accordance with EPA Method 9 during each test run performed. The observer will be positioned in accordance with the method taking into consideration plant operations and traffic patterns. Data will be recorded at 15-second intervals throughout each test and reduced to 6-minute averages of 24 consecutive readings.

5.0 ANALYSIS OF DATA AND REPORT FORMAT

Data and observations collected during this test will be evaluated and summarized in a report to be submitted to DEC within 60 days following completion of testing. The report will contain a full discussion of results as outlined below:

1. A summary containing a concise description of the test program including, A) reasons for/objectives of the test, B) the manner in which tests were conducted, and C) pertinent conclusions including a tabular summary comparing measured results with compliance limits,

2) A description of POHC/waste blends,

3) A description of process operating conditions including, waste/chlorine feed rates, kiln conditions, and air pollution control system operating parameters, presented in a similar format to the compliance monthly report,

4) A description of monitoring locations and techniques,

5) Test results including, hydrogen chloride emission rates and observations of plume characteristics, i.e. opacity and, where possible, odor where the plume(s) contacted the ground, and corresponding meteorological conditions,

6) Test data; both raw and calculated data including, where appropriate, QA/QC data,

7) A discussion correlating test results to test conditions, including the identification of any difficulties or departures from intended test conditions and an explanation of their impact, if any. An attempt will be made to compare trail-off/opacity observations made during the test period, with records of historical observations to see if opacity can be statistically correlated with high chlorine feed rates.

8) Tables and graphs presenting the relationship between HCl emission rates and opacity, versus scrubber water blowdown rate and halogen feed rate. An optimum halogen feed rate and scrubber water blowdown rate will be proposed for the Part 373 Permit.

9) Results of analysis of ammonia nitrogen on scrubber water samples, and an evaluation of the impact on scrubber water treatability. Depending on the results, additional treatability studies may be proposed.

10) Appendices containing information on instrumentation, detailed process data, etc.

6.0 SCHEDULE

This testing will be initiated in April, 1995 and concluded by May 24th. The report will be submitted by July 24th, allowing NYSDEC sufficient time to evaluate Norlite's proposed permit conditions for halogen feed rate prior to completion of construction of the permanent wastewater treatment plant. This is anticipated to be completed by November 1, 1995.

APPENDIX A

HCl CEM PROTOCOL

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Procedure: Continuous Emissions Monitoring for Hydrogen Chloride

Prepared By: Edward C. Burgher, Environmental QA/QC Manager, Norlite Corporation

1.0 Introduction

The following procedure describes the monitoring methodology including the sampling system, continuous analyzer and system calibration methods.

2.0 Sampling System

The sampling system is comprised of three major components, a sample probe / sample filter enclosure, a heated sample line and a sample pump. The general configuration of the sampling system is shown in Figure 1.

The insulated, heated probe / filter enclosure, fabricated by Norlite, is located at the 85 foot level (i.e., at the lower stack platform). The probe assembly is composed of 1/4" Teflon tubing, a Teflon filter holder and media (5 micron pore size), and a 3-way 316 stainless steel valve were contained in the enclosure. The probe protrudes approximately 1 foot into the stack.

The three-way valve is located immediately upstream of the sample filter assembly to permit calibration gas delivery to the probe assembly.

The probe enclosure is heated (Whatlow Model 375 Strip Heater) to maintain a minimum temperature of 250•Fto prevent HCl loss through condensation.

The sample line (Technical Heaters / Clean Air Engineering) is also heated and controlled to maintain a minimum sample temperature of 250•F.The sample line is approximately 200 feet in length.

The sample pump (ADI Model 19310) is located immediately downstream of the analyzer. The sample pump is capable of developing a vacuum capacity of 22 in. Hg which is sufficient to maintain sample system residence time of less than 90 seconds from the probe to the analyzer scrubber.

Figure 2 depicts the heated sample enclosure.

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3.0 Sample Analysis

Continuous gas stream analysis is performed using a TESS-COM Model 745 TGA, SN 1115HCL, Ambient Low Level Gaseous Chloride Analyzer. The theory of operation is as follows:

The gas sample is passed into a glass scrubber by the sample pump. The sample flowrate is maintained at a constant by the entrance orifice to the scrubber. A positive displacement pump introduces a constant flow of ionic strength adjusted scrub solution into the scrubber. The scrub solution (distilled water, nitric acid and potassium nitrate) is buffered to maintain a constant ionic strength. As the gas stream is bubbled through the scrub solution, chloride ions are formed from HCl in the gas stream. A second metering pump extracts a liquid sample, at a constant rate, from the scrubber and delivers it through a debubbler into the temperature controlled (18°C)flow cell housing the reference and measuring Cl^- ion-selective electrodes. The difference in potential between the two electrodes corresponds to the activity of the chloride ion concentration.

Measurement data are then electronically amplified and buffered to an output range of 4 - 20 mA. During the trial burn the analyzer was calibrated over a range of 0 - 100 ppm.

3.0 System Calibration

The TESS-COM HCl analyzer is first calibrated using an internal calibration system using two buffers containing known concentrations of chloride (Cl^-) ions. Prior to introducing the buffers to the analyzer, gas sample flowrate is verified using a Gilmont Instruments Model Size 3 Flowmeter, SN 31501 - 31600. Liquid sample flowrate is verified using a stopwatch and graduated cylinder following the instrument manufacturer's procedure. To calibrate the analyzer for a range of 0 - 100 ppm, a buffer containing 1 ppm Cl^- is used to standardize the meter and electronics. A second buffer containing 100 ppm Cl^- is then used to set the instrument's slope.

After the instrument's internal calibration has been set, calibration gas (HCl in N_2, balance) is input at the probe (see Figure 2) to check the analyzer response while sampling through the entire system. Calibration gas (Scott Specialty, Inc., SN 1AO21342, cert. 6/3/92, 48 ppm) is exhausted into a clean 20 liter Tedlar bag after the bag has been purged at least three time with the calibration gas. The Tedlar bag is then transported to the heated sample box location and attached to the calibration gas port.

If the results are not within tolerances (± 10%) the scrub solution replacement rate and/or the sample uptake from the scrubber were increased or decreased, accordingly, until calibration results are acceptable.

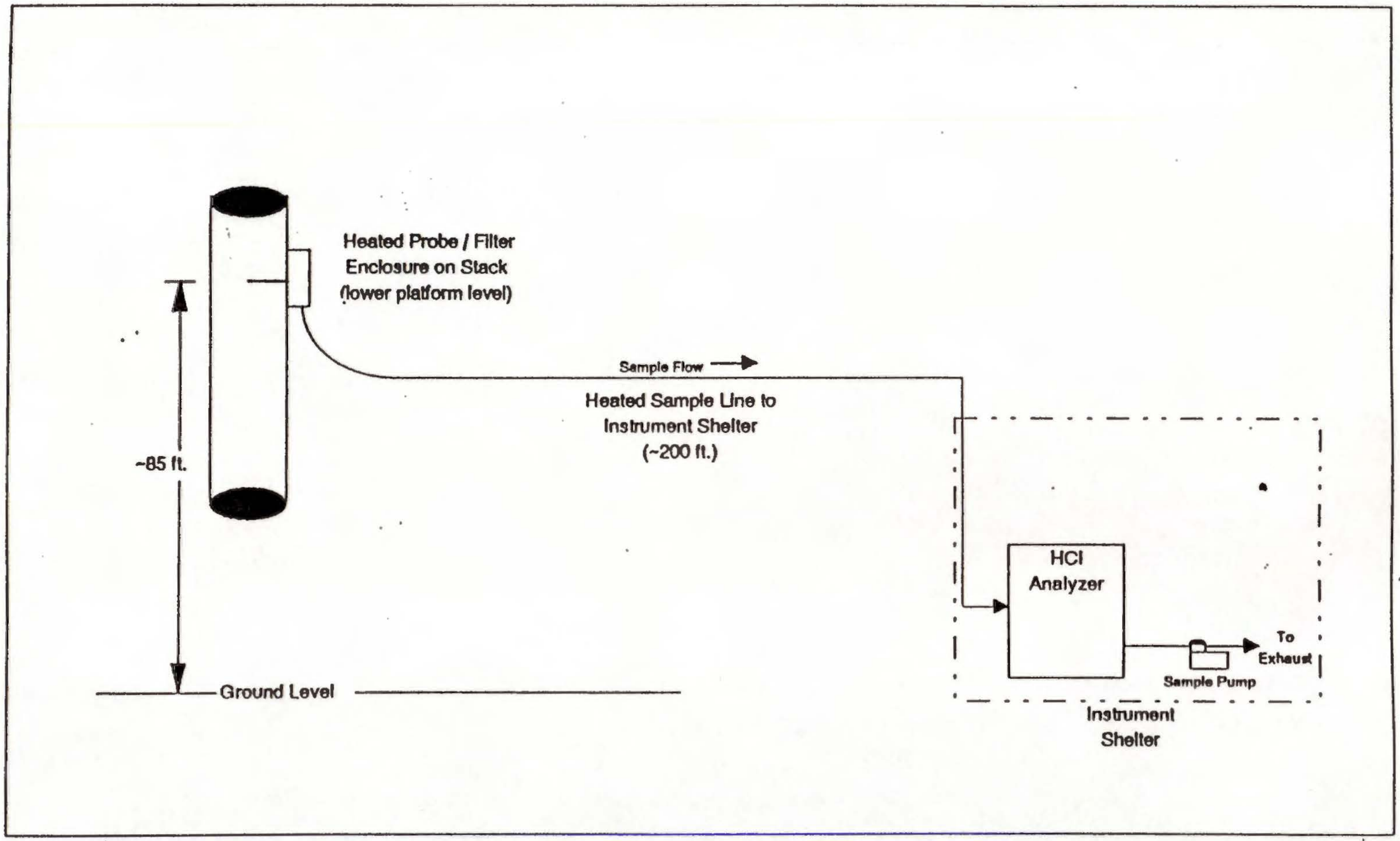

Figure 1
CEMS Sampling System

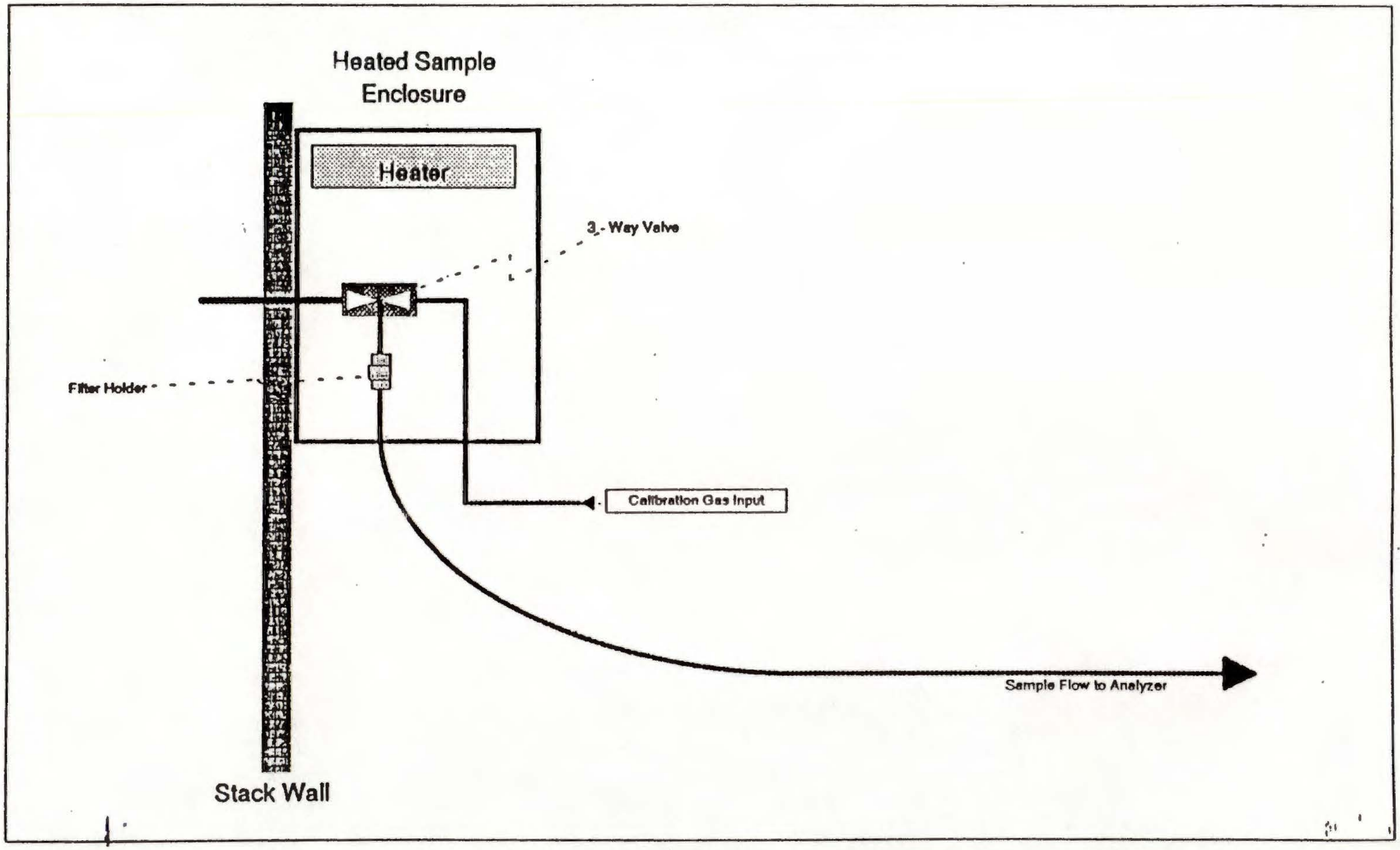

Figure 2
Sample Probe Enclosure

APPENDIX B

DESCRIPTION OF POHC SPIKES

Upstream of the micro motion flow meter, a spike POHC blend will be precisely injected into and mixed with the LGF feed. The POHC will be fed by a precise metering system at a rate which will ensure total halogen feed of approximately 440 lbs/hr. Spiking POHC compounds of known assay will be purchased in their "pure" state in drums and metered into the LGF line at a point upstream of the micro motion meter and burner. The feed rate of the spike compounds will be precisely measured using a weigh scale.

During the test, the drums of POHC will be pumped into a 250 gallon POHC feed tank. The POHC will be precisely metered and injected into the LGF line by the POHC feed system depicted in Figure 3. A variable metering pump will be used to control the POHC injection feed rate. A precise electric scale will be used and the weight of POHC recorded. The POHC will be mixed thoroughly with the LGF by an inline static mixer. The uniformly blended LGF/POHC mixture will flow through the micro motion meter and fired through the kiln burner assembly.

The chlorine content of the blended POHC mix will be calculated based on the purity of the technical grade POHC spiking compound used. The POHC feed rate will be calculated based on the weight of POHC spike feed into the LGF. There is no solvent carrier for the POHC spiking mixture. The concentrations of chlorine in the LGF will therefore be calculated based on the total LGF blend feed. "LGF" Blend" will consist of:

LGF Feed + POHC Spike
+ diluent added to achieve needed BTU content of the LGF blend

Besides the above metering systems, the POHCs may be added directly to the LLGF in tanks, to blend to a level that will yield a feed rate of approximately 440 lbs/hr.

Potential List of POHCs for Chlorine Spike to LGF Feed

POHC	SUPPLIER	UN
1,1,1-trichloroethane	Vulcan, PPG or Dow Chemical	2831
perchloroethylene	Dow Chemical	1897
trichlorobenzene	Unison	2321
tetrachlorobenzene	Unison	

All POHCs will be either industrial or technical grade.