



MEMO

TO: WAYNE JACKSON, CRAIG SIMMONS

FROM: PAUL MULHOLLAND

DATE: JULY 21, 2014 (UPDATED FROM MAY 1, 2014 MEMO)

RE: WASTE MANAGEMENT FACILITY FLARE RECOMMENDATION

ATTACHMENTS:

- i. QUOTATION FROM ENVIRO EMD INC. DATED FEBRUARY 21, 2014
- ii. EMAIL FROM ENVIRO EMD INC. DATED FEBRUARY 25, 2014
- iii. FLARE SYSTEM CONDITION ASSESSMENT AND RECOMMENDATION OF UPGRADE FOR PROLONGED OPERATION DATED MAY 30, 2014 FROM FILTERVAC INTERNATIONAL INC.
- iv. RECOMMENDATION FROM ENVIRO EMD INC. DATED JULY 4, 2014

As you aware the landfill gas flare at the Peterborough County/City Waste Management Facility requires upgrades to comply with Technical Safety and Standards Authority (TSSA) regulations. The following summarizes current information regarding the status of the landfill flare.

TSSA Inspection and Development of Request for Quotation

On May 29, 2013 the TSSA performed an unscheduled inspection of the flare and associated components. The inspection report listed a number of items that do not comply with current TSSA regulations. Since that time site meetings have been held to determine the appropriate course of action regarding the flare.

In October 2013 UEM developed a scope of work for a Request for Quotation (RFQ) to complete the work noted in the initial TSSA inspection. A mandatory site meeting for contractors was held on Thursday, October 24, 2013. Of the contractors that attended the mandatory site meeting, only Enviro EMD Inc. provided a quotation to complete the work. As a result Enviro EMD Inc. was awarded the contract for repairs to flare system components. They have already completed one task required by TSSA by inspecting the stainless steel pipe used in the flare compound and issuing a report.

Variance from TSSA Deadline

With Enviro EMD Inc.'s original quotation they provided recommendations to complete work beyond the scope of the RFQ. In Enviro EMD Inc.'s previous experience with TSSA and CSA Standards regarding landfill flares they have noted that the work recommended in their expanded quotation would be required for compliance with appropriate standards. After review of Enviro EMD Inc.'s quotation with regards to TSSA standards and CSA standards, UEM agreed with the Enviro EMD Inc.'s recommended upgrades. It is UEM's opinion that the additional upgrades would be required by the TSSA and would be noted as non-compliant in future inspections if not completed. The scope of the original RFQ included tasks to resolve only items noted by TSSA during their initial inspection.

A site meeting was held on January 13, 2014 with UEM, City staff, TSSA and Enviro EMD Inc. in attendance. Options on possible flare system modifications discussed included upgrading the existing components of the flare to comply with TSSA or replacing the flare and associated components with a new system that would be compliant.

Following the meeting TSSA issued an updated inspection report and approved a City variance application providing the City with an extension to January 31, 2015 to comply with TSSA regulations

Options for TSSA Compliance

The two options noted above were discussed with Enviro EMD Inc. They were asked to revise their quotation based the January 13, 2014 meeting and to provide a rough estimate for the supply and installation of a new flare. The quotations for both tasks are attached.

Enviro EMD Inc. estimated cost to supply and install a new flare and associated components is \$430,000 (not including HST). This assumes that no existing system components can be salvaged. The price does not include the cost to remove and dispose of the old flare and unsalvageable components. If the City chooses to install a new flare, a complete engineered design will be required. Detailed design, new flare and system component fabrication and delivery will take several months, followed by installation which would take several weeks to two months.

Enviro EMD Inc.'s quotation to upgrade the existing flare compound to be compliant with TSSA standards is \$82,706.64 (not including HST). The attached quotation details the work, which could be completed within approximately 10 weeks of approval to proceed.

Replacing the existing flare with a new candlestick flare was previously discussed, considered and determined not to be a feasible option. Stack modeling and MOE approvals would be required and take least 6 months or more, followed by removal of existing infrastructure and installation of the candlestick flare.

Flare and Refractory Assessment

It was previously recommended in the original May 1, 2014 memo that an assessment of the existing flare and refractory be undertaken to confirm the condition of the flare. UEM recommended that Enviro EMD Inc. be retained by the City to inspect the flare. The preferred approach to address TSSA requirements would be based on the conclusions of the assessment of the flare system. Enviro EMD Inc. retained Venture Refractories Inc. to inspect the flare. A copy of the May 30, 2014 inspection report is attached.

The inspection report stated that the overall steel structure is sound with no need for replacement. Enviro EMD Inc. recommended replacement of the existing burner table at a cost of \$5,815 (not including HST) due to deteriorating of the existing burner table. Given the limited use of the flare, it is UEM's opinion that this is optional and should be completed if and when needed. However, Enviro EMD Inc. did state that the refractory blanket needs to be replaced for extended operation at a cost of \$49,573.50 (not including HST).

Enviro EMD Inc. had estimated the cost to remove and replace the existing flare refractory, sandblast the interior of the flare, install new anchors, paint the interior of the flare with rust preventative coating and re-install a new refractory would be \$35,000.00 (not including HST). Disposal costs are not included.

Refractory replacement should be completed, but the actual cost, whether it is \$35,000 or \$49,573.50, should be determined.

Additional Recommendations from Enviro EMD Inc.

Enviro EMD Inc. recently provided a detailed proposal outlining additional upgrades to the electrical components and controls at the flare compound. These upgrades are intended to prolong the life of the flare components while providing optimal operation with the new equipment installed as part of the TSSA compliance upgrades. The total cost of these upgrades is \$18,060 (not including HST). UEM has reviewed the proposal and is of the opinion that these upgrades should be completed as part of the TSSA compliance work.

UEM's Recommendations

With the gas utilization plant in operation the existing flare is used sparingly. After inspection of the flare it appears the most cost effective approach for TSSA compliance would be for the City to move forward hiring Enviro EMD Inc. to complete the following:

1. \$82,706.74 to retrofit components of the flare compound as described in the Enviro EMD Inc. quotation

2. \$35,000 or \$49,573.50 should be spent to restore the existing flare. Actual cost to be confirmed.
3. \$18,060 to upgrade electrical components and controls.
4. If the City wishes, the existing burner table can be upgraded for \$5,815. This is not required at this time.

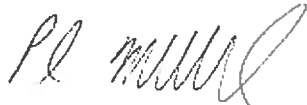
From these quotations, the maximum total cost to comply with TSSA standards would be \$156,155.24 (not including HST). This includes the higher cost refractory restoration as well as the optional burner table upgrade in order to show highest cost. Although the costs have increased as more information became available, this is still significantly less expensive than replacing the entire flare.

Given that Enviro EMD Inc. was the only contractor to submit a quotation as part of the original RFQ, UEM recommends moving forward with Enviro EMD Inc. to complete this work.

Please feel free to contact me with any questions or comments. I can be reached at (519) 752-8686 Ext 22.

Yours very truly,

Urban and Environmental Management Inc.



Paul Mulholland, P. Eng.
Project Manager

QUOTATION

Quote No.: DE-13-018 Rev.2

Enviro EMD Inc.

845 Boxwood Drive
 Cambridge, ON, N3E 1A4
 Phone: (519) 653-6464
 Fax: (519) 653-6469

QUOTATION TO: City of Peterborough Corporate Services, Tenders and Proposals Main Floor City Hall 50D George Street North Peterborough, Ontario, K9H 3R9 Attn: Sandra Clancy Director of Corporate Services	SHIP TO ADDRESS: Peterborough Waste Management Facility 1260 Bensfort Road Peterborough, Ontario, K9J 6X7
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DATE	SHIP VIA	F.O.B.	CURRENCY	PAYMENT TERMS
21-Feb-14	Enviro EMD Truck	Peterborough, ON	Canadian Dollars	See Below

Item	Qty	Description	Unit Price	Total Price
UPGRADES REQUIRED TO LANDFILL GAS FLARING SYSTEM AT BENSFORT ROAD FACILITY, PETERBOROUGH				
1	1	Mechanical Engineering for TSSA Approval including: - site visit/P&ID review/Bill of Materials - completion of TSSA application - addendum to existing manual(s) to include updated items only	\$ 3,000.00	\$ 3,000.00
2	1	Electrical/Control Engineering for TSSA Approval including: - site visit/P&ID review/Bill of Materials - completion of TSSA application - modifications to existing system electrical drawings and PLC program	\$ 3,000.00	\$ 3,000.00
ELECTRICAL/CONTROLS REPAIR/CHANGES				
3	1	Burner Management System: Supply/install replacement Fireye burner management system (BMS) into the existing control panel and provide engineering/wiring/programming of the new BMS. The BMS will provide the required flame monitoring as well as control of the flare purging, pilot ignition and safety valve control as per relevant codes. Note: The current Fireye 45UV5-1009 UV Scanner will be maintained but the existing burner control will be replaced with a Fireye E110 series controller.	\$5,350.00	\$5,350.00
4	1	Rewire PLC control panel as required to maintain existing functions while integrating the new BMS into the controls as per code requirements. Includes installation of controls for new damper actuator, purge blower, pilot fuel train and double safety valves. Develop, test, install and commission new PLC programming.	\$2,840.00	\$2,840.00
5	1	Replace existing damper actuator with Belimo NMX240MFT-S N4 actuator with integral limit switch and wire into PLC controls and BMS controls.	\$2,200.00	\$2,200.00
6	1	Install necessary controls and provide field wiring of new safety valves.	\$1,130.00	\$1,130.00
MECHANICAL UPGRADES				
7	1	Supply /Installation of TSSA Certified Pilot Fuel Train Line/Supply by G1 Certified Technician: Supply/Install (1) Pressure Regulator Valve(1/2") and (1) Relief Valve Supply/Install Primary and Secondary solenoid valve (1/2") in pilot light line (Qty 2 in total PN: EF8214G3017S28 120AC). Material Constructions are as follows: Solenoids have aluminum body construction and seals/disc are constructed of NBR, Core Tube is constructed 30SSS, Core Guide is constructed of Acetal, rider ring is constructed of Telfon(PTFE), Core/Plug Nut 430F SS, springs are 302SS, Shaving coil is copper, pipe plug is zinc plated steel. Rated for Class 1, Div. 2 Supply/Install Piping, fittings, unions and Test fire Valve Note: All new pipe fittings are to be supplied in carbon steel and all ball valves to be constructed of brass.	\$3,455.00	\$3,455.00
8	1	Labour to Upgrade Existing Valving to CAN/CSA-B149.3-05 Standards -Remove existing Manual Butterfly Valves and replace with Milliken manual Plug Valve (1) upstream of the blower. - Remove existing Flowseal Electrical Valve - Install (1) CSA 6.5 rated Shut-off Valve (9a or 9b) upstream of the blower as per (Sect.5.3.4)* - Install (1) CSA 6.5 rated Shut-off Valve (9a or 9b) downstream of the blower as per (Sect.5.3.4)* -Install (1) Check Valve downstream of the blower - Installation of (1) Milliken Manual Plug Valve as a test fire valve. (Sect.5.5.1)** - Install (1) Varec Thermal Shut Off Valve -Modifying existing piping required to install all above mentioned valves.	\$4,940.00	\$4,940.00
9a	0	Supply – FPS 90D-10 6" Automatic Ball Valve, Pneumatic - CSA 6.5 Approved (Qty:2 Req'd)		NA
	0	Nitrogen Bottle w/ 2 Stage Regulator, setup & mounting (does not include bottle rental){Qty:1}		NA

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Enviro EMD Inc.

845 Boxwood Drive
 Cambridge, ON, N3E 1A4
 Phone: (519) 653-6464
 Fax: (519) 653-6469

Quote No.: DE-13-018 Rev.2

QUOTATION TO: City of Peterborough Corporate Services, Tenders and Proposals Main Floor City Hall 500 George Street North Peterborough, Ontario, K9H 3R9 Attn: Sandra Clancy Director of Corporate Services	SHIP TO ADDRESS: Peterborough Waste Management Facility 1260 Bensfort Road Peterborough, Ontario, K9J 6X7
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21-Feb-14	Enviro EMD Truck	Peterborough, ON	Canadian Dollars	See Below

Item	Qty	Description	Unit Price	Total Price
UPGRADES REQUIRED TO LANDFILL GAS FLARING SYSTEM AT BENSFORT ROAD FACILITY, PETERBOROUGH				
9b	2	Supply – Maxon 6"HC MA11 Automatic Ball Valve; CSA 6.5 Approved, Electro-Mechanical Model 600HMA11/BCS2-BB32A0 (Viton O-Ring/Viton Bumper)	\$19,070.00	\$38,140.00
10	2	Supply – Milliken 6" 171MH Lubricated Manual Plug Valves - CGA 3.16 Approved) Note: Qty 1 valve is removed from scope of supply as TSSA mentioned it is not required to install a manual valve downstream of the	\$1,562.50	\$3,125.00
11	1	Supply (1) – Varec 6" 430 Series Thermal Shut-off Valve (CSA B149.6-11)	\$3,345.00	\$3,345.00
12	1	- Supply of Qty 1 TECHNOCHECK #5004-CAL-B ANSI 125 FLANGE 6" CHECK VALVE	\$873.00	\$873.00
13	1	-Supply of stainless steel 6" flanges/pipe/consumables to install the above valves	\$1,155.00	\$1,155.00
TESTING/START UP AND INSPECTION COSTS				
14	1	Electrical Safety Authority (ESA) Inspection (includes 1 electrician on site) Cost of ESA inspection to be determined, will be billed at actual cost + 15% administrative fee	\$350.00 TBD	\$350.00
15	1	TSSA Inspection Costs (1 programmer & 1 G1 technician for one day)	\$2,600.00	\$2,600.00
SCOPE OF WORK REQUIRED FROM ORIGINAL TENDER				
16	1	Item 2: Relocate existing Propane Tanks and supply lockable Cage	\$2,875.00	\$2,875.00
17	1	Item 4: Painting Landfill gas piping, tubing and fittings and controls	\$517.86	\$517.86
18	1	Item 6: Installation of a union for the manual valve on the drain line	\$395.00	\$395.00
19	1	Item 8: Restoration	\$760.00	\$760.00
20	1	Item 9: Confirm material of landfill gas pipe	\$1,855.88	\$1,855.88
21	1	Item 10: Attend Site Meeting with TSSA on Jan 9/2014	\$800.00	\$800.00
			Subtotal	\$82,706.74
			Sales Tax	\$10,751.88
			Total	\$93,458.61

OPTIONAL ITEMS:				
22	1	Hinge (1) one damper to provide inside access (replaces need for access hatch or removal of items).	\$925.00	\$925.00
23	1	Supply/Install 2" Blast Gate Observation Port (PN: 2B60P-Q)	\$575.00	\$575.00
			Subtotal	\$1,500.00
			Sales Tax	\$195.00
			Total	\$1,695.00

TERMS & CONDITIONS

FOB: All prices include the supply of material and labour to the Benfort Facility in Peterborough, Ontario
 Delivery: 9-10 Weeks
 Currency: Canadian Dollars
 Taxes: HST Extra
 Terms: -40% down payment upon approval of TSSA engineering application
 Price Validity: 30 days
 -60% payment upon TSSA final approval
 NOTE: This quotation is based upon our best knowledge at this time. Price is subject to change if extra requirements are determined to be required by TSSA during either the Engineering review or site Inspection.

Marcel Rybensky
 General Manager, Enviro EMD

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Main Floor City Hall
500 George Street North
Peterborough, Ontario, K9H 3R9
Attn: Sandra Clancy
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UPGRADES REQUIRED TO LANDFILL GAS FLARING SYSTEM AT BENSFORT ROAD FACILITY, PETERBOROUGH				

Appendix:

***Sect. 5.3.4**

An appliance that has a maximum rated input in excess of 10 000 000 Btuh (3000kW), up to and including 50 000 000 Btuh (15 000 kW), with a single burner or multiple burners with individual burner flame safeguard controls shall be equipped with not less than two automatic safety shut-off valves piped in series and wired in parallel that are certified in accordance with ANSI Z21.21/CSA 6.5 and marked C/I)

****Sect. 5.5.1**

A test firing valve shall be installed on all burners and shall be located downstream of all safety shut-off valves and as close as practicable to the burner.

Paul Mulholland

From: marcel@filtervac.com
Sent: Tuesday, February 25, 2014 8:36 PM
To: Joe Ovcjak
Cc: 'Ken Stienstra'; Paul Mulholland
Subject: RE: Peterborough
Attachments: DE-13-018 REV 2 PETERBOROUGH.pdf

Joe,

Please find attached a revised quote blending the pertinent part of the original scope of the tender along with the required upgrades to meet the latest TSSA report. Please note that all valves have increased in price due to newly issued 2014 pricing and also due to the large appreciation of the US dollar relative to the Canadian Dollar.

For budget pricing on a new flare or costs of replacing the refractory, please consider the following prices:

Refractory:

To remove the old refractory, sandblast the interior of the flare, install new anchors, paint the interior of the flare with rust preventative coating and re-install new refractory (3" thick), the costs would be approx. \$35,000.00 (Taxes Extra). This would require the work to be done at site with the flare horizontally laid down at location. All crane costs to remove and re-install the flare are included in the above pricing.

To provide an evaluation of the current refractory and it's life expectancy, we are able to arrange a site visit with our refractory installer at a daily rate of \$800.00

New Blower Skid/Flare Installation:

Based on past jobs (Lindsay, which was a 300 CFM flare) done with similar requirements, a budget price for a turnkey installation of a new Flare and Blower Skid (including mechanical/electrical/installation/commissioning) would be approx. \$430,000.00 (Taxes Extra). We would have to see if there was any existing equipment (ie. Blower, gas analyzer) that could be incorporated into our design to reduce this cost.

You would have to consider the extra costs of removing/disposing of the old flare/equipment and any civil requirements (concrete pads for the blower skid and flare, fencing) and associated building permits to carry out this work. Our price would include all TSSA and ESA engineering review and inspection costs. In addition you would have to consider engineering/project administration costs.

Regards,
Marcel

From: Joe Ovcjak [mailto:jovcjak@uemconsulting.com]
Sent: February-24-14 3:08 PM
To: marcel@filtervac.com
Subject: RE: Peterborough

Thanks – a solid ball park supply and installation cost would be fine, as the intent is to provide a comparison to replace the flare instead of making the modifications.

If you feel the price is within a certain error range (15%, 25%) please let me know as well

Thanks



FILTERVAC INTERNATIONAL INC.

FILTERVAC INTERNATIONAL INC.
UNIT 1, 845 BOXWOOD DRIVE
CAMBRIDGE, ONTARIO N3E 1A4
CANADA

Phone No.: (519) 653-6464
Fax No.: (519) 653-6469
E-Mail: sales@filtervac.com

May 30, 2104

Joseph Ovcjak
Urban Environmental Management Inc.
5100 Orbitor Drive, Suite 300
Mississauga, ON L4W 4Z4

Dear Mr. Ovcjak,

Subject: City of Peterborough Flare System Condition Assessment and Recommendation of Upgrade for Prolonged Operation

Please be advised, the subject matter is a separate one from upgrading the flare system for TSSA compliance, which is proposed under different cover in our proposal, Ref #: DE-13-018 Rev. 2.

1. Background Information

To our understanding, the City of Peterborough is planning to operate the flare for another 20-25 years after 14 years in operation. Prior to the generator was brought into operation in June 2013, the flare had been running 24/7 for 13 years. The record ever since has showed an operation of 2.75 hours in October 2013, 8.5 hours in November 2013, and 47.5 hours in December 2013. This operational pattern will be a better representation of the current situation and trending for future.

2. Purpose of Inspection

- 1) Check the steel structure of the flare for obvious corrosion that will jeopardize the extended operation
- 2) Examine the current status and provide approximation on the life expectancy of the currently installed refractory

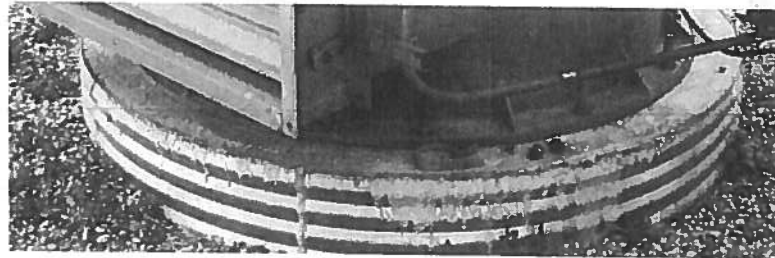
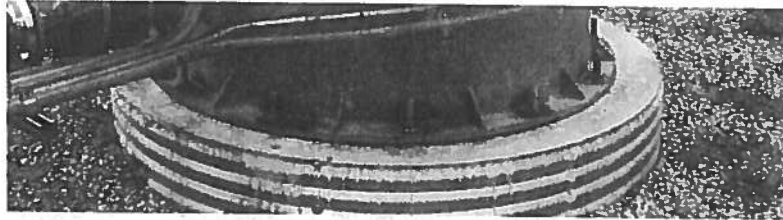
3. Techniques/Instruments of Inspection

In order to find out the thickness of steel materials, an Olympus 38DL Plus Ultrasonic Thickness Gauge is rented and used. Multiple points around flare shell and at two different heights were sampled.



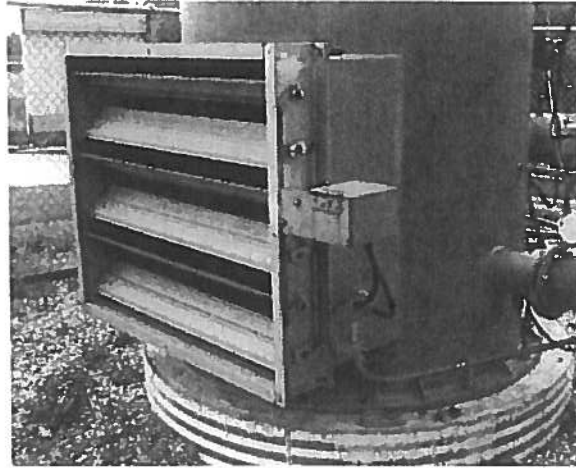
4. Discoveries

4.1. The Base Ring



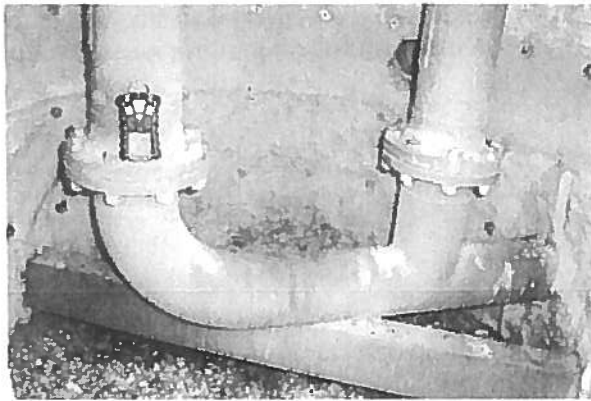
There is no obvious corrosion either on bolting or weld between the shell and the base ring. It's deemed structurally sound.

4.2. The Damper



It deemed structurally sound to serve its continuing operation. Applying light grease spray on pivoting points of shaft and linkage will free the drive from binding.

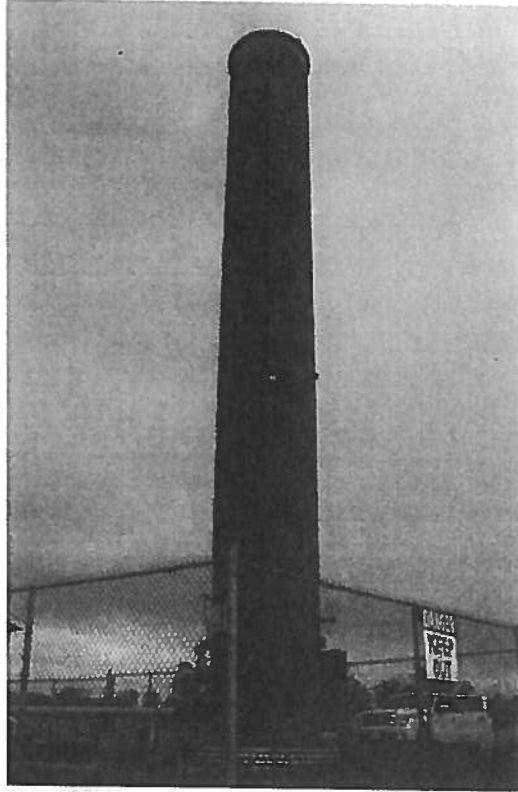
4.3. The Burner Manifold and Burner Tips



The burner manifold and burner tips are deemed sound enough for much lesser frequency of operation in the future.

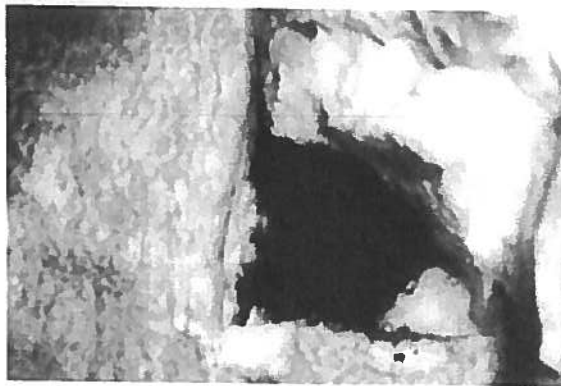
4.4. The Shell

4.4.1. Exterior Surface:



The steel shell appeared to be in good condition. The ultrasonic thickness testing proved this to be an accurate assessment. Measurement of wall thickness within three feet section above table, which is directly exposed to flame, has been taken and showed no signed of change of thickness at multiple points of sampling.

4.4.2. Behind the Blanket:



Due to the fact that the interior of the flare stack wasn't painted/coated by the original manufacturer (confirmed by UEM with John Zink), apparent peeling of rusty scale exist but measurement on thickness by ultrasonic thickness gauge proved no harm has caused on the substrate.

4.5. The Burner Table



Around Burner above Burner Table



Above Burner Table

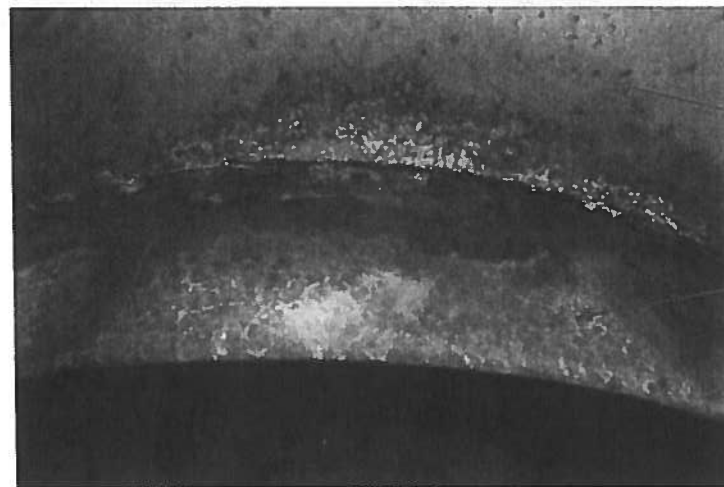
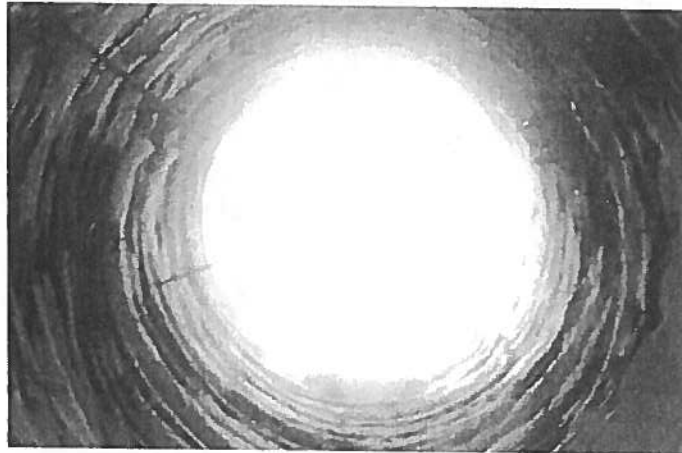
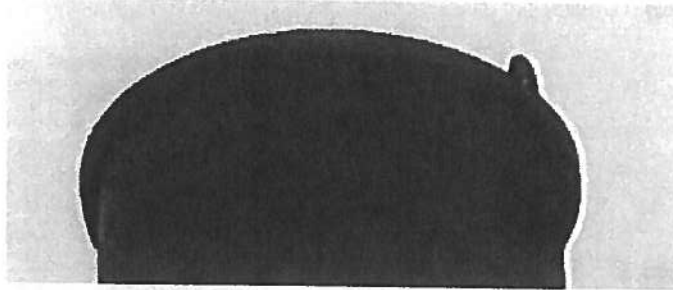


Table Top

Enclosing Ring of Burner

Burner table is deteriorating. Obvious crevice corrosion is taking place at the junction of table top and enclosing ring of burner with significant signs of rust. There is no structural damage of the substrate and no imminent necessities for replacement. Refractory lining on top of table is deteriorating and shall be replaced.

4.6. The Rain Cap



The rain cap shows no obvious damage from corrosion. No obvious sign at top section of refractory lining from losing of protection of rain cap appears. Due to its inaccessibility, no close and direct observation of rain cap condition has been conducted.

4.7. The Refractories



The refractory ceramic fibre is showing signs of crystallization deterioration, would most likely be caused from a combination the methane gas impurities and outside contaminants, rain, snow leaving deposits of iron on the refractory surface and age.

Some of anchors were corroded and the tips broke off with the removal of the washers, where others were still in good condition.

4.8. The Conclusion and Recommendation

Based on our discoveries, we would like to propose the following:

- 1) Overall steel structure is deemed substantially sound and should have no issue in supporting extended operation except the burner table is deteriorating. Although there is no imminent necessity for replacement of the burner table, we can't foresee it's going to last long enough to cover the expected 20 plus years of operation. For future replacement, we propose to replace the table with a standalone one covered with refractory on top for better protection of manifold and dampers down below. For ease of installation, the new table will come in segments. The burner table will be floor mounted on pedestals and then be bolted together for rigidity. To install it, gravels at the bottom of the flare need to be cleared out so pedestal supports can be anchored. The gravel will then be put back.

To supply and install burner table on site in one day:

Our Price: \$5,815.05 plus applicable tax.

- 2) Refractory blanket shall be replaced for extended operation. We propose to replace refractory on site on spot including removing the existing ceramic fiber lining from inside the flare; install new 601 Inconel twist lock studs; the flare would be lined 1" of Cerablanket 8# density ceramic fiber, backed up with 1" of Cerablanket 6# density ceramic fiber; table top and self to be lined with 3" Cerablanket c/w twist lock studs and washers; the hot face blanket would be overlapped 20% and installed vertically secured in place with 601 Inconel twist lock washers; All anchoring to be 601 Inconel twist lock studs and washers.

Work quoted to be done on site at spot in Peterborough, Ontario in one week.

Our Price: \$49,573.50 plus applicable tax.

To maintain the thermal dynamics of combustion, it's important to keep the inner diameter of the chamber the same as before. Therefore, a combined 2" thick 8# and 6# refractory lining is quoted.

Let us know how you would like to proceed.

Sincerely yours,



Steven Du
Project Engineer

<Exhibits #1>

1. Olympus 38DL Plus Ultrasonic Thickness Gauge;
2. Illustration of sampling points of thickness measurement (shell and table);
3. Assessment on refractory lining by our refractory specialist Venture Refractories Inc.

Olympus 38DL Plus Ultrasonic Thickness Gauge



The 38DL PLUS is an innovative instrument that signals a new era in ultrasonic thickness gauging. Ideally suited for almost every ultrasonic thickness application, this handheld thickness gauge is fully compatible with a full line of dual and single element transducers. The versatile 38DL PLUS can be used in applications ranging from wall thinning measurements of internally corroded pipes with dual element probes to very precise thickness measurements of thin or multilayer materials with single element transducers.

Key Features

- Corrosion thickness gauging with dual element transducers
- Designed for EN15317
- Differential mode and Reduction Rate mode
- Dual and single element transducer compatibility
- Explosive Atmosphere: Safe operation as defined by Class I, Division 2, Group D, as found in the National Fire Protection Association Code (NFPA 70), Article 500, and tested using MIL-STD-810F, Method 511.4, Procedure I.
- Internal Oxide/Scale software option
- Olympus High Dynamic Gain technology with digital filters
- Thickness, Velocity, and time-of-flight measurements
- THRU-COAT™ and Echo-to-Echo measurements on painted and coated surfaces
- Time-based B-scan mode; 10,000 reviewable readings per scan
- V-Path Builder for custom V-path compensation

Applications

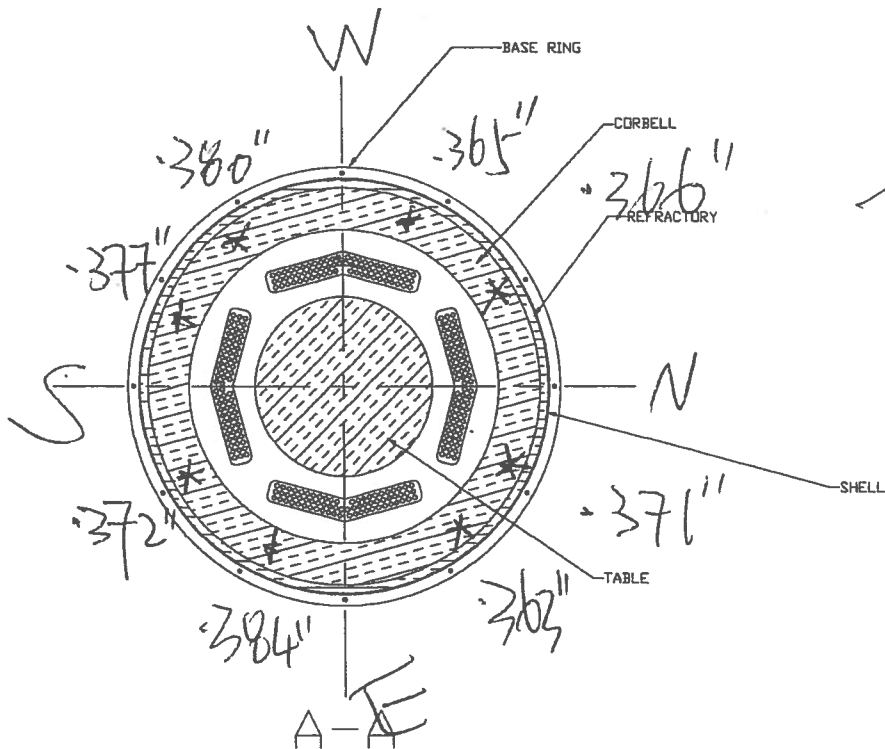
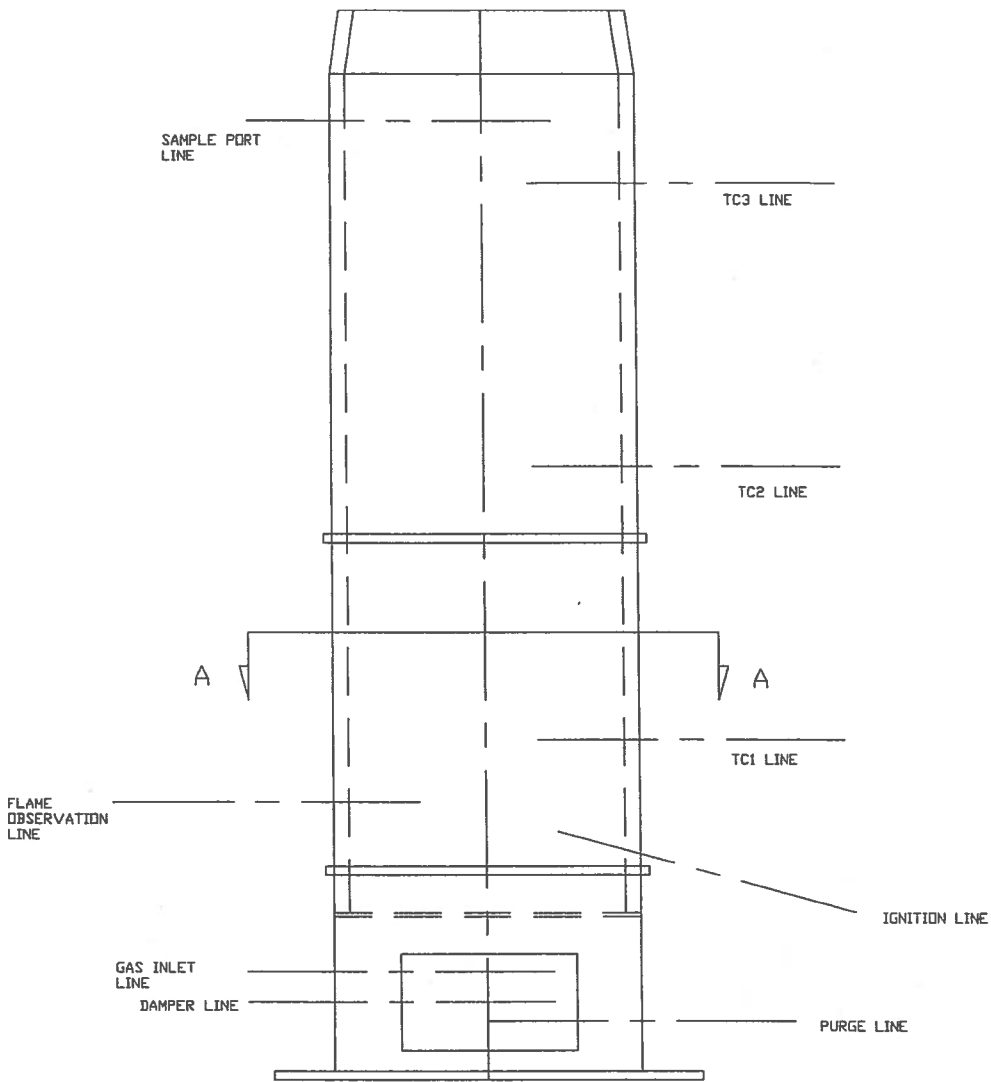
- Thickness measurement
- Wall thinning measurement

Technical Specification

Title	Values
Thickness range	0.08 mm (0.003 in.) to 635 mm (25 in.)
Standard resolution	0.01 mm or 0.001 in. for all transducers
High temperature measurements	500 °C (932 °F)

Dimensions

Title	(mm)	(inch)	(kg)	(lb)
			0.814	1.8

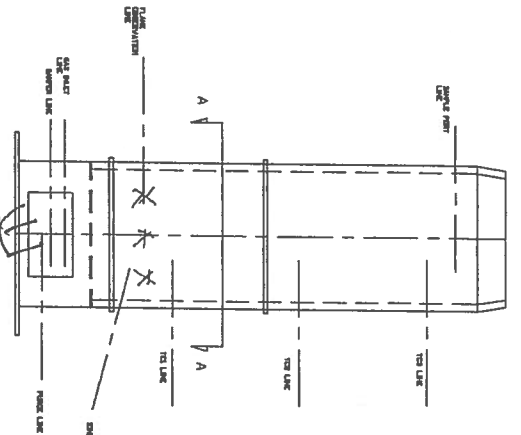
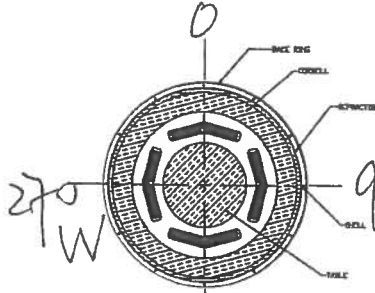
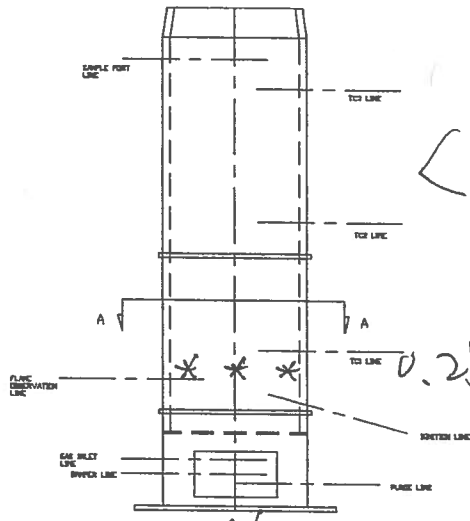
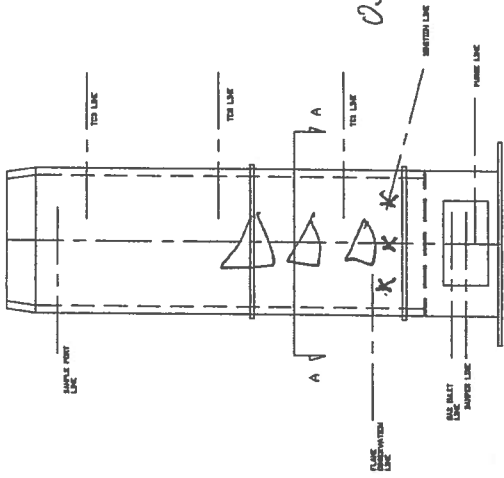


May 23, 2014
Table Thickness

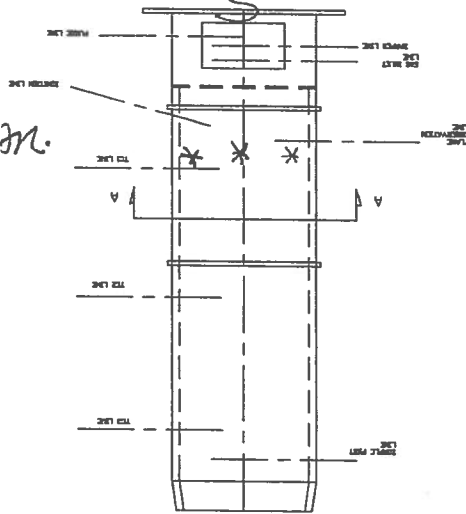
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 No. of Burner: 2
 (Lower Section)

0.276", 0.245", 0.273" (60")

0.256" 0.247" 0.252" (65")



0.248", 0.251", 0.248" (72")



0.229", 0.251", 0.258" (66")

Max Thickness

May 23, 2014

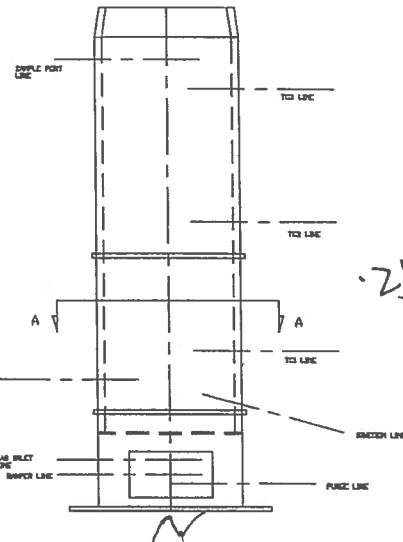
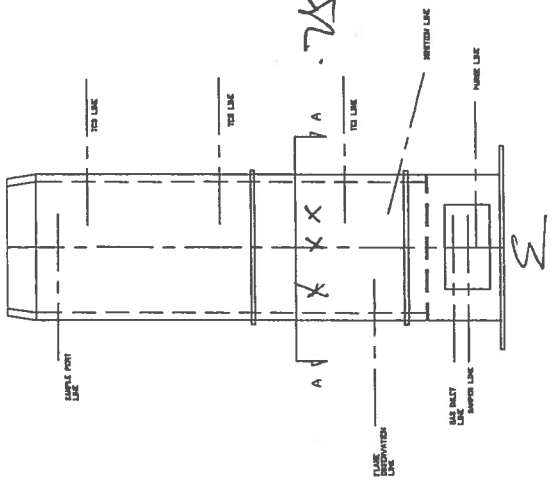
May 23, 2014

Table Height = 60"

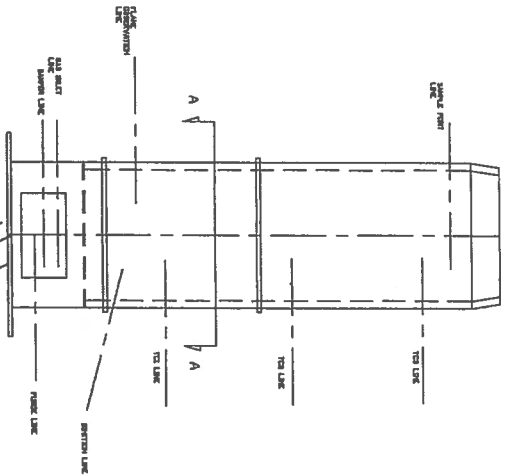
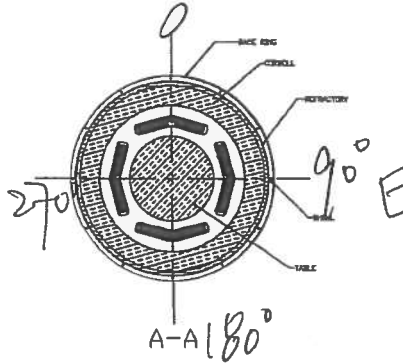
Wan Thickness

252", 242", 244" (84")

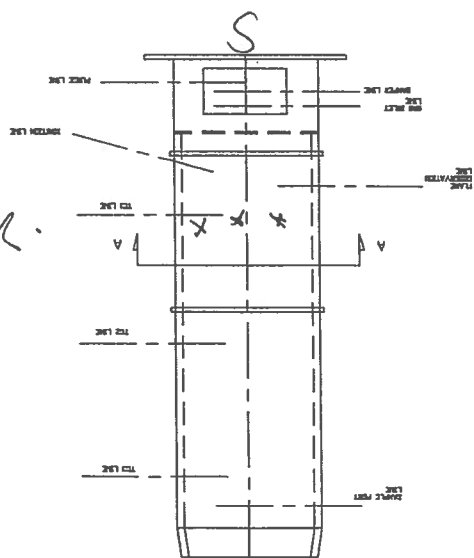
< Higher Section >



.256", .250", .250" (84")



244", 255", 252" (84")



.259", .264", .254" (80")

VENTURE  **REFRACTORIES INC.**

**BEST UNDER
FIRE**

11 Kenyon Street
Brantford, ON N3S 7R7

Tel.: (519) 758-5882
Fax: (519) 758-5879

Filtervac International Inc.
845 Boxwood Drive
Cambridge, Ontario, N3E 1A4
Fax: (519) 653-6469
E-mail: stevend@filtervac.com

Monday, 26 May 2014
Inspection report

Attention: Mr. Steven Du

Subject: Bensfort Landfill Site Flare, Peterborough, Ontario.

Inspection on Friday, May 23, 2014

Refractory and Anchoring Assessment:

The refractory ceramic fiber is showing signs of crystallization deterioration, would most likely be caused from a combination the methane gas impurities and outside contaminates, rain, snow leaving deposits of iron on the refractory surface and age.

Some of anchors were corroded and the tips broke off with the removal of the washers, where others were still in good condition.

The steel shell appeared to be visually in good condition and the ultrasonic thickness testing proved this to be an accurate assessment.

Determination:

It would be my option that in order to keep this equipment in operating condition for another twenty (20) years plus, the complete lining and anchoring system should be completely replaced.

This could be accomplished with the flare in it's current location.

Yours truly,



John Easton
VENTURE REFRACTORIES INC.
E-mail: undrfire@execulink.com

1-888-4-HOT-ROX

Enviro EMD

ENVIRO EMD INC.
UNIT 1, 845 BOXWOOD DRIVE
CAMBRIDGE, ONTARIO N3E 1A4
CANADA

Phone No.: (519) 653-6464
Fax No.: (519) 653-6469
E-Mail: sales@filtervac.com

July 4, 2104

Joseph Ovcjak
Urban Environmental Management Inc.
5100 Orbitor Drive, Suite 300
Mississauga, ON L4W 4Z4

Dear Mr. Ovcjak,

Subject: City of Peterborough Flare System Condition Assessment and Recommendation of Upgrade for Prolonged Operation

Please be advised, the subject matter is separate from upgrading the flare system for TSSA compliance which is proposed under different cover in our proposal, Ref #: DE-13-018 Rev. 2.

1. Introductory Information

To our understanding, the flare has been in operation for 14 years and the City of Peterborough is planning to operate the flare for another 20-25 years. There has been a lot of changes to typical flare controls designs since this flare was designed and built in 1999. Many changes will be made as a result of the requirement to meet the current CSA B149 gas code as administered by the TSSA. However, there are other upgrade and repairs that we will detail here in this proposal that reflect both the desire to have the system operational for the next 20-25 years as well as to operate in such a manner as to provide a safe and easy operation in addition to properly meeting the gas destruction requirements dictated by the C of A and the M.O.E.

The main PLC control panel for this system was designed on the basis of the PLC controlling the majority of the functions of the extraction blower, valves and flare. A separate temperature controller is used for the flare temperature control and a selector switch allows manual selection of the controlling thermocouple. A number of selector switches and pilot lights on the door of the PLC panel provide feedback on the operation as well as allow the operator to manually control a number of the devices (valve, blower, condensate pump).

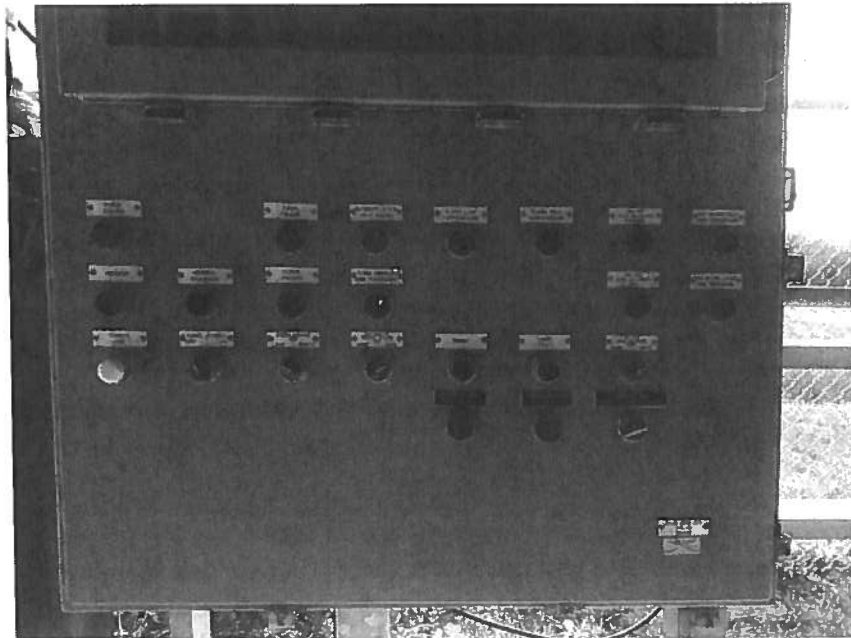


System Control Panel

The current PLC is a GE Fanuc Series 90-30 unit with 120VAC digital input and output cards. This series of PLC is still available but this particular system is now 15 years old. The documented program for this PLC is not available and only print copies of the simplified electrical drawings for this panel are available.

As part of the TSSA upgrade, a significant portion of this panel will need to be rewired and reorganized in order to integrate the required Burner Management System (BMS) into the controls and the PLC program will need to be significantly revised. As part of the current TSSA upgrade proposal, we have included modifying these existing drawings as required and adding a page for the new BMS controller.

As a general comment, it is apparent that this system has been modified over the years but few, if any, of the modifications have been captured in the current drawing set.



Control Panel Door

As part of integrating the BMS into the controls, a number of current functions will be eliminated which will include:

- Local/Remote System Control – The B149 requires a manual latching circuit to be integrated into one of the safety valves. This means that an operator must be present at the system to start the operation and push the button to latch this valve open.
- Automatic Block Valve Hand/Off/Auto – The BMS will have exclusive control of the Safety Valves (replaces the Block Valve) and no manual operation is permitted.
- Gas Blower Hand/Off/Auto – Since the BMS has exclusive control of the valves, it is normal to eliminate the ability to manually start the blower since this could lead to the situation where the blower is running against closed valves. There could be an argument made that this function needs to be available for blower maintenance purposes but this would need to be decided by the operations group.

These functions will not be included in the new design and the associated selector switches will be removed.

A critical safety function of a landfill gas extraction and flaring system is the monitoring of the landfill gas CH₄ (methane) and O₂ (oxygen) levels. When the system is running, a high O₂ level can lead to a potentially explosive situation where the landfill gas can burn in the piping. The analyser monitors the gas concentrations and provides alarm functionality to both alert the operator and shut down the system as needed. This system does have a stand-alone gas analyser but there are no details available on how, or if, the analyser is tied into the flare controls.

The design of the flare itself is based on maintaining the gas to be destructed at a minimum combustion temperature for a minimum period of time which is referred to as the retention time. Typical values are 871C and 0.75 seconds. This means that the temperature in the flare at the designated control point must be maintained at or above 871 C to meet the C of A requirements. This flare has three thermocouples mounted at different elevations on the flare. Each elevation corresponds to the retention time requirement for a specific flow rate. As per the drawings, the thermocouple locations correspond to 167 CFM (TE202C), 333 CFM (TE202B) and 500 CFM (TE202A). However in this design there is no flow meter to indicate the actual flow of the gas so the selection of the thermocouple to control the flare temperature is left to a manual selector switch. It is unknown how this switch is used at this time. The landfill gas blower is run from a variable speed drive in which the blower speed, and hence the gas flow rate, is set manually. These design limitations would lead to the inescapable conclusion that there is no reliable manner for this flare to be run in compliance of the C of A other than when the TE202A thermocouple is selected for control and it is assumed that the blower at its set speed cannot exceed the designed 500 CFM flow rate of gas to the flare.

To address these obvious issues, modern flares include instrumentation and controls to automate all of these critical functions and ensure that when the flare is operating the key design requirements for temperature and retention time are always being met.

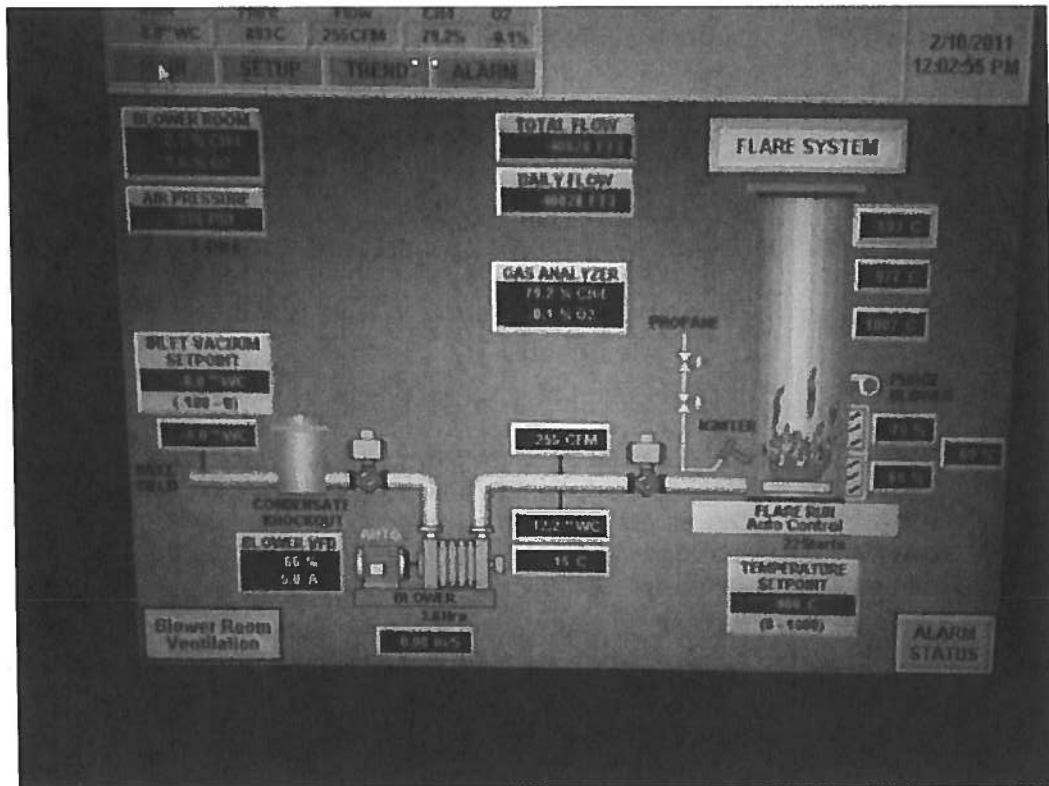
UPGRADE PROPOSALS

Item 1:

To provide modern equipment which will be ready for the next 20-25 years of service and to also address a number of the issues detailed above we propose to gut the existing control panel and provide a new designed control system including a new PLC and HMI (Human Machine Interface Touchscreen) to replace the existing PLC and temperature controller. The new PLC will include thermocouple inputs to allow the flare thermocouples to be tied directly into the PLC and analog inputs and outputs to allow the PLC to directly monitor and control as required the gas analyser readings, landfill gas blower VFD speed and the flare's combustion air damper actuator. With this integrated design the system will have a new modern control structure that will provide the following features:

- 1) Automatic thermocouple selection based on blower speed (the blower curve will be used to associate the blower speed reading with anticipated gas flow rates). The operator will set the desired blower speed on the HMI and the PLC will set the controls as required.
- 2) PLC control of the temperature control will provide enhanced start-up functionality and ensure that the required flare temperature is maintained at all times. Enhanced programming will allow the system to automatically handle failed thermocouples to allow the system to keep running as reliably as possible. Additionally the PLC control and monitoring of the flow and temperature control of the system will allow extra alarm features to be integrated. The HMI will be used to provide a time-stamped alarm status display including historical data storage and display.
- 3) PLC control and monitoring of the flare's damper actuator will allow device failure alarms to be generated in the case of a actuator problem.
- 4) The HMI will provide the operator the facility to monitor and control the system including setting temperature and blower speed setpoints, alarm setpoints for temperature as well

as gas quality (CH4 and O2).



Example HMI Screen

Additionally, this PLC panel upgrade will provide a complete set of current (new) electrical drawings and new PLC equipment.

COST: \$9,340.00

Item 2:

The existing variable frequency control (VFD) is a Magnetek GPD 506 unit. Magnetek has since been bought by Yakasawa and the GPD series is now obsolete. As part of modernizing the system in anticipation for another 20-25 years of service, we propose to replace this VFD with a new Schneider Altivar ATV21 series model. As part of this upgrade we will create and provide new electrical drawings for the VFD panel.

COST: \$3,620.00

Item 3:

To provide a better means to monitor and control the flare flow rate we propose to supply and install a FCI ST51 flowmeter in the main fuel train. This flow meter will be tied into the PLC and used for a number of functions including:

- Automatic flow rate control: The PLC will automatically set the blower speed to maintain

the desired gas flow rate.

- Automatic thermocouple selection: The selection of the thermocouple to be used will be automatically and accurately selected by the PLC to ensure that the required retention time is always being met. The proper thermocouple selection is key in avoiding low temperature situations where the flare temperature cannot be maintained above the minimum setting because the incorrect thermocouple is being used to control the damper.
- Flow totalizer: The PLC will keep a running totalizer showing the daily total amount of gas being flared as well as a historical listing of the previous two weeks of daily totals.

COST: \$5,100.00

General Notes:

The current design allows the PLC to automatically start the flare when a remote signal is received as well as to try automatic restarts when the flare fails to start. The current B149 codes do not allow either of these functions to be maintained. A local "latch" button must be included on one of the safety valves to ensure that the operator is present to start the system and trigger this latch function. Additionally, any failure condition that leads to the BMS experiencing a loss of flame while running will cause the BMS to lock out and this lockout condition can only be reset right on the BMS. This forces the situation where the operator must be at the system to restart any failure.

It is the requirement of the B149 code that the BMS be the exclusive control for all functions associated with purging, ignition, flame monitoring and safety valve controls. As such, no manual controls for these systems can be provided and the current manual controls for the valve and the blower will be eliminated.

There is currently a Sensaphone 2000 system incorporated into the control panel to provide autodialler alarm functionality and it is assumed that this function is still working. The Sensaphone can also work as a data logger for critical analog measurements such as flare temperature and gas analyser readings. It is expected that this is being done although the drawings do not reflect this. However, it is necessary that the data is uploaded on a regular basis as data storage is limited. Typically it is a requirement of the C of A that this critical data is collected and stored for a number of years. With the new PLC, it could be possible with further investigation to link the PLC to the generator plant so that this data could be collected and stored in that plant's control system.

SUMMARY:

The above proposals are intended to provide a modern system with both current drawings and a current PLC program. We feel it is important to provide the necessary controls to ensure that the system operates as originally intended and as expected by the Ministry of the Environment.

Ken Stienstra, P.Eng.
H.S. Electric/Enviro EMD
ken@enviroemd.com
(519) 808-9771