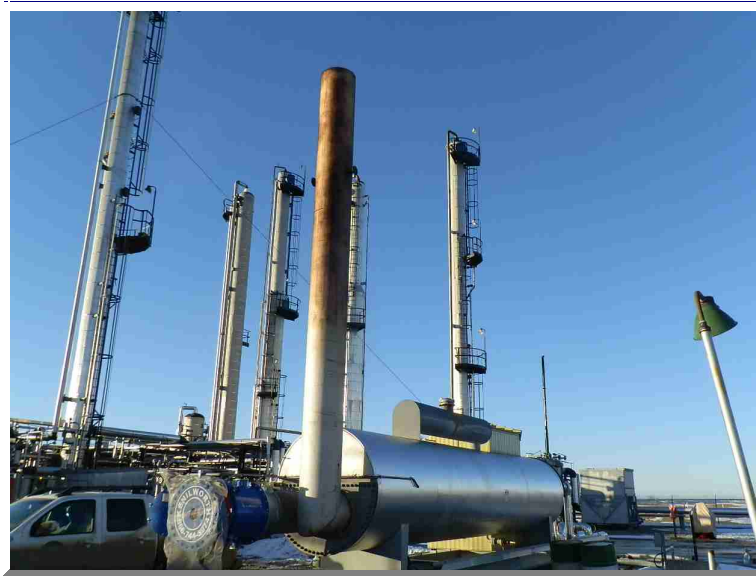


CONFIDENTIAL

Design Code Field Approval Appliance Approved for Kenilworth Combustion

Owner / Operator: Husky Energy Inc.
Plant: Sylvan Lake
Area:
LSD: 01-21-38-02-W5
Tag Number: H-440
Appliance Type: Line Heater
Appliance Serial No: 2007-7738-01



Report / Print Date: 12/19/2014
ENEFEN Project: NFN1411034

Attention

This Appliance is approved and may be operated.
This package contains a rating/approval plate that must be attached to the appliance
and may be subject to an inspection by the Authority Having Jurisdiction.



ENEFEN Energy Efficiency Engineering Ltd.

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ENEFEN Energy Efficiency Engineering Ltd.

FIELD APPROVAL CERTIFICATE

FIELD APPROVAL **FA1411034** 20141219_1030

REPORT DATE 19 DEC 2014

PROJECT DESCRIPTION: Design Code Field Approval

Prepared By Christopher Pascua BSc

Reviewed By Rodger Talstra P.Eng.

Client/Consultant Kenilworth Combustion

Contact Kenneth Westergaard

Email kwestergaard@kenilworth.ca

Tel 778-484-3974

Cell 250-826-3974

Fax

Owner / Operator Husky Energy Inc.

Plant Sylvan Lake

Area

Elevation 3225 ft | 983 m

Jurisdiction AB

Process Gas Plant

Function Indirect Fired Gas Heating

Appliance Line Heater

Appliance Tag H-440

LSD 01-21-38-02-W5

Serial Number 2007-7738-01

INSPECTION BODY REQUIREMENTS USED AS BASIS FOR FIELD APPROVAL:

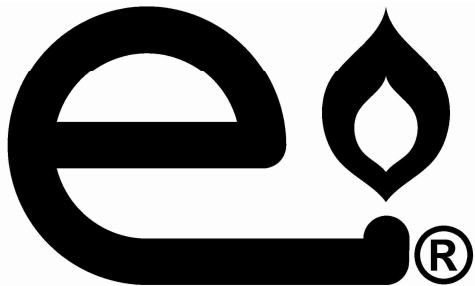
- ISO/IEC 17020:2012
- Standards Council of Canada CAN-P-1608 Appendix C: Commercial and Industrial Gas-Fired Appliances and Equipment
- Any or all of the current versions of the following:
 - CAN/CSA-B149.1 Natural gas and propane installation code
 - CAN/CSA-B149.2 Propane storage and handling code
 - CAN/CSA-B149.3 Code For The Field Approval Of Fuel-Related Components On Appliances and Equipment
 - CAN/BNQ 1784-000 Canadian Hydrogen Installation Code
 - CSA B51 Boiler, pressure vessel and pressure piping code
 - CSA STD C22.1 Canadian Electrical Code, Part I Safety Standard for Electrical Installations
 - CSA STD C22.2 No. 0-M91 (R2006) General Requirements - Canadian Electrical Code, Part II
 - Variances or provincial deviations (such as VAR-GAS-05-05{rev 2} Gas Safety Variance on the application of CAN/CSA-B149-3.05, Alberta Municipal Affairs, Safety Codes Council) as may be issued from time to time by the Provincial or Territorial Regulatory Authority
 - Relevant requirements of the National Building Code of Canada and the National Fire Code of Canada

SCOPE:

Our FIELD APPROVAL is limited only to the safety aspects of the combustion system as required by the above regulations and does not include other design aspects, such as detailed compliance with the project or owner specifications, and the suitability of the equipment for any specific purpose, process conditions or performance requirements. We base our acceptance in this regard on a general statement of compliance with project specifications, and on documentation received for evaluation.

FIELD APPROVAL VALIDITY:

Under the authority of the Alberta Safety Codes Act, Chapter S-1 Section 38(1) and Alberta Municipal Affairs File: 16570-G01 Province Wide Variance VAR-GAS-01-13 (July 1, 2013): Engineered Designs For Site Specific Gas-Fired Process Equipment.



APPROVED BY:
Jozef Jachniak, P. Eng.

APPROVED DATE:
18 Dec 2014

PERMIT TO PRACTICE:
P08977



FIELD APPROVAL COMPLETE

APPROVAL DETAILS ARE IN THE APPLIANCE DATA REPORT

PROJECT INFORMATION

20141219_1030

ENEFEN number NFN1411034
Project description Design Code Field Approval
Jurisdiction AB
Design code O1-U5_2011_HP_PILOT_PF_24
Name

Appliance Identification

Process Gas Plant
Function Indirect Fired Gas Heating
Type Line Heater
Tag Number H-440
LSD 01-21-38-02-W5
Plant Sylvan Lake
Area
Serial Number 2007-7738-01
Site elevation 983 m
CRN number
A number

Appliance Information

Manufacturer Alco Gas & Oil Production Equipment Ltd.
Project number
Built where Edmonton AB
Date built 2007
Model number
Installed by Kenilworth Combustion
Project number 11667
New or upgrade Upgrade
Date September 2014

Client Information

Company name	Kenilworth Combustion		
Project number	11667		
Branch/plant	Lloydminster		
Department/area	Mechanical Design		
Contact name	Kenneth Westergaard		
Contact email	kwestergaard@kenilworth.ca		
Contact phone	778-484-3974	Extension	
Contact cell	250-826-3974	Fax	

Owner/Operator Information

Company name	Husky Energy Inc.		
Project number			
Branch/plant	Sylvan Lake		
Department/area			
Contact name	Lawrence Borowicz		
Contact email	lawrence.borowicz@huskyenergy.com		
Contact phone	403-321-3885	Extension	
Contact cell	403-321-3885	Fax	

Consultant Information

Company name	Pronghorn Controls		
Project number			
Branch/plant			
Department/area			
Contact name	Stan Neu		
Contact email	sneu@pronghorn.ca		
Contact phone	403-362-2526	Extension	
Contact cell	403-501-4895	Fax	

PROJECT SUMMARY

20141219_1030

NFN Number	NFN1411034	Product Type	Design Code Field Approval		
Design Code	O1-U5_2011_HP_PILOT_PF_2	Project Status	Appliance Approved		
Inspected By	Garth Blades	Owner	Husky Energy Inc.	LSD	01-21-38-02-W5
Inspected	12/14/2014	Plant	Sylvan Lake	Tag	H-440
Prepared By	Christopher Pascua BSc	Area		Serial	2007-7738-01
Reviewed By	Rodger Talstra P.Eng.	Contact	Kenneth Westergaard	Phone	778-484-3974

CODE COMPLIANCE SUMMARY

Fuel train layout compliant?	Yes
Fuel train sizing compliant?	Yes
Fuel train installation compliant?	Yes
Burner installation compliant?	Yes
BMS FSG installation compliant?	Yes
Permissives installation compliant?	Yes
Controls installation compliant?	Yes
Appliance installation compliant?	Yes
Panel electrical inspection?	NA
Electrical seals installed?	Yes
Electrical installation compliant?	Yes
Flammable gas venting compliant?	Yes
Gas piping installation compliant?	Yes
Stack installation compliant?	Yes
All components certified or approved?	Yes
All technical documentation complete?	Yes
System compliant with all current gas & electrical codes?	Yes

RECOMMEND Correction is recommended but not required for compliance

Burner Capacity Utilization	201 % Burner is overfired. Recommend reviewing burner and fuel input design.	Recommend
Stack Temperature Notes	High. Stack temp between 350-650oF/175-340oC above bath temp. Results in lower efficiency. Recommend review of the combustion design. Adjustment of the burner and combustion air flow may be necessary.	Recommend
Excess Air Notes	O2 is in the somewhat high range of 3.5-5.5% and results in lower efficiency Recommend review of the combustion design. Adjustment of the burner and secondary air flow may be necessary.	Recommend

APPLIANCE DATA						20141219_1030
NFN Number	NFN1411034	Product Type	Design Code Field Approval			
Design Code	O1-U5_2011_HP_PILOT_PF_2	Project Status	Appliance Approved			
Inspected By	Garth Blades	Owner	Husky Energy Inc.	LSD	01-21-38-02-W5	
Inspected	12/14/2014	Plant	Sylvan Lake	Tag	H-440	
Prepared By	Christopher Pascua BSc	Area		Serial	2007-7738-01	
Reviewed By	Rodger Talstra P.Eng.	Contact	Kenneth Westergaard	Phone	778-484-3974	
128 LOCATION INFORMATION						
Burner Location	Outdoor					Noted
Fuel Train Location	Kenilworth Windbox					Noted
Control Panel Location	Outdoor					Noted
Maximum Design Ambient Temperature	40 deg C 104 deg F					Noted
Minimum Design Ambient Temperature	-29 deg C -20 deg F					Noted
161 PROCESS INFORMATION						
Process Cycle %	100 %					Noted
Annual Operation %	100 %					Noted
Appliance Function	Indirect Fired Gas Heating					Noted
Appliance Type	Line Heater					Noted
Combustion Air Source	Natural Draft					Noted
Combustion Air Preheat	No preheat					Noted
Minimum Combustion Air Temperature	-40 deg C -40 deg F					Noted
Bath Fluid	Tri-ethylene Glycol					Noted
Bath Fluid Temperature	182 deg C 360 deg F					Noted
Bath Fluid Pressure	0 kPag 0.0 psig					Noted
162 APPLIANCE INFORMATION						
Process Duty	1.76 GJ/h 1.67 MM Btuh					Noted
Appliance Efficiency HHV	75.5 %					Noted
Fuel Total Input (HHV)	2.34 GJ/h 2.21 MM Btuh					Noted
Flame Safeguard System Logic Type	Single Burner FSG					Noted
Number of Burners	1					Noted
Burner Fuel Input (HHV)	2.335 GJ/h 2.214 MM Btuh					Noted
Main Burner Max. Design Pressure	89.6 kPag 13.0 psig					Noted
Main Burner Min Design Pressure	6.9 kPag 1.0 psig					Noted
Pilot Configuration	Separate venturi style pilot					Noted
Pilot Type	Intermittent / Continuous					Noted
Pilot Fuel Input (HHV)	0.03 GJ/h 0.03 MM Btuh					Noted
Pilot Pressure	40.7 kPag 5.9 psig					Noted
Ignition Type	Electric ignition from BMS					Noted
Instrument Control Method	Electric					Noted
Is it a Pressure Vessel?	No					Noted
163 MAIN FUEL SUPPLY						
Main Fuel Type	Process Gas					Noted
Is Main Fuel Sweet?	Sweet					Noted
Is Main Fuel Dry?	Dry					Noted
Main Fuel Source	Plant process					Noted

APPLIANCE DATA

Page 2 of 7

Main Fuel Composition Known	No. Assumed to be standard sales gas composition.	Noted
Main Fuel Odorization	Not Odorized	Noted
Main Fuel Scrubber	Mechanical Scrubber	Noted
Main Fuel Filter	Y-Strainer in main fuel train.	Noted
Main Fuel Overpressure Protection	PSV integral to upstream PRV protects the main PRV.	Noted
Main Fuel PSV	Mercer	Noted
Main Fuel PSV Setpoint	862 kPag 125.0 psig	Noted
Main Fuel Preheat	No preheat	Noted
Upstream Line Pressure Regulator	Fisher 630 ~ 3/16in. orifice ~ 90-150psi spring ~ 1500/200+SP psi max inlet/outlet ~ -29oC	Noted
Upstream Line Pressure Regulator Setpoint	599.84 kPag 87.00 psig	Noted
Line Pressure Regulator	Fisher 627R ~ 1/4in. orifice ~ 15-40psi spring ~ 500psi max inlet ~ -29oC	Noted
Line Pressure Regulator Setpoint	151.68 kPag 22.00 psig	Noted

164 SECONDARY FUEL SUPPLY

Secondary Fuel Type	Not approved for secondary fuel use	Noted
---------------------	-------------------------------------	-------

165 PILOT FUEL SUPPLY

Pilot Fuel Type	Process Gas	Noted
Is Pilot Fuel Sweet?	Sweet	Noted
Is Pilot Fuel Dry?	Dry	Noted
Pilot Fuel Source	Same as main fuel	Noted
Pilot Fuel Composition Known	No. Assumed to be standard sales gas composition.	Noted
Pilot Fuel Inlet Pressure	89.6 kPag 13.0 psig	Noted
Pilot Fuel Odorization	Not Odorized	Noted
Pilot Fuel Scrubber	Mechanical Scrubber	Noted
Pilot Fuel Filter	Y-Strainer in main fuel train.	Noted
Pilot Fuel Overpressure Protection	PSV integral to main fuel train PRV protects the pilot PRV	Noted
Pilot Fuel Preheat	No preheat	Noted

172 ELECTRICAL INFORMATION

Electrical Area Classification at Burner	Unclassified	Noted
Electrical Area Classification at Fuel Train	Unclassified ~ Kenilworth windbox	Noted
Electrical Area Classification at Control Panel	Class 1 Zone 2	Noted
Available Primary Main Power	120 VAC / 60 Hz	Noted
Available Primary Main Power Source	Utility / Grid	Noted
Available Primary Main Power Amps	15 amps	Noted
Available Primary Control Power	24 VDC	Noted
Available Primary Control Power Source	Plant UPS (utility backup)	Noted
Available Primary Control Power Amps	5 amps	Noted
All Electrical Seals Installed?	Yes.	Noted
Is all electrical wiring properly installed	Yes.	Noted
Is all required grounding present?	Yes.	Noted

181 HEATER SHELL

Shell Type	Horizontal with expansion tank above	Noted
Shell OD	1524 mm 60.00 in	Noted
Shell Length / Height	8 m 26.00 ft	Noted

APPLIANCE DATA

Page 3 of 7

Shell Insulation Scope	Fully insulated with sheet metal clad	Noted
Shell Insulation Thickness	51 mm 2.00 in	Noted

182 HEATER FIRETUBE

Number of Firetubes	1	Noted
Firetube Type	Horizontal U-tube with constant diameter.	Noted
Number of Passes	2	Noted
Firetube OD	508 mm 20.00 in	Noted
Immersed Length of Assembly	8 m 25.00 ft	Noted
Firetube Surface Area	27 m ² 290 ft ²	Noted
Firetube Nominal Process Rating	3.06 GJ/h 2.90 MM Btuh	Noted
Firetube Design Heat Flux	65.37 MJh/m ² 5754 Btuh/ft ²	Noted
Firetube Achievable Efficiency (HHV)	77.5 %	Noted
Firetube Appliance Efficiency HHV	75.5 %	Noted
Firetube Condition	Firetube acceptable	Noted

183 HEATER STACK

Stack Type	Same diameter as firetube	Noted
Stack OD	508 mm 20.00 in	Noted
Stack Height	6 m 20.00 ft	Noted
Stack Wind Shroud	None	Noted
Stack Cap	None	Noted
Stack Damper	None	Noted
Stack Insulation Scope	None	Noted
Drain Port Plug	Stack drain port not installed.	Noted
Stack Cleanout Port	Not installed	Noted
Air Preheat Sleeve	No.	Noted
Stack Sampling Port	Drilled hole with plug.	Noted

184 HEATER WINDBOX

Windbox Manufacturer	Kenilworth	Noted
Windbox Serial Number	2659	Noted
Windbox Material	Welded steel with paint	Noted
Windbox Type	Round with door	Noted
Wind Box Gasket	All required gaskets are installed and in good condition.	Noted
Windbox ID	610 mm 24.00 in	Noted
Windbox Depth	610 mm 24.00 in	Noted
Windbox Volume	0.178 m ³ 6.283 ft ³	Noted
Windbox Size Factor	0.076 m ³ /GJh 2.84 ft ³ /MM Btuh	Noted
Windbox Gas CL to Liquid	122 cm 48 in	Noted
Windbox Gas CL to Burner Tip	132 cm 52 in	Noted
Burner tip insertion depth	10 cm 4 in	Noted
Burner Access	Hinged front door with bolts	Noted
Windbox Air Adjustment	None	Noted
Windbox Viewport	4 inch Peep Sight	Noted
Is the Ignition Transformer Module mounted correctly	Yes.	Noted

APPLIANCE DATA

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185 HEATER FLAME CELL

Number of Flame Cells Per Windbox	1	Noted
Flame Cell Material	Aluminum	Noted
Flame Cell Location	Front	Noted
Flame Cell OD	610 mm 24.00 in	Noted
Flame Cell ID	102 mm 4.00 in	Noted
Total Flame Cell Surface Area	0.28 m2 3.05 ft2	Noted
Flame Cell Size Factor	0 m2/GJh 1.38 ft2/MM Btuh	Noted

186 HEATER MAIN BURNER

Burner Make	Kenilworth modified Eclipse	Noted
Burner Size	3 in 76.2mm	Noted
Burner Mixer	Kenilworth with Flame Scavenger	Noted
Main Burner Orifice Size	M 7.4930mm 0.2950in	Noted
Burner Sleeve	Kenilworth Compound Barrel	Noted
Burner Nozzle	Kenilworth Turbulator	Noted
Burner Fuel Input Capacity (HHV)	1.161 GJ/h 1.100 MM Btuh	Noted
Burner Capacity Utilization	201 % Burner is overfired. Recommend reviewing burner and fuel input design.	Recommend

187 HEATER PILOT BURNER

Pilot Make	Natco modified	Noted
Pilot Size	1/2 in 12.7mm 0.50in	Noted
Pilot Mixer	Kenilworth modified Natco venturi mixer with brass orifice (no.58 or drilled larger)	Noted
Pilot Burner Orifice Size	#58 ~ 1.0668mm ~ 0.0420in	Noted
Pilot Sleeve	Straight Pipe Nipple	Noted
Pilot Nozzle	Kenilworth RHSB	Noted
Pilot Location	At 5:00 position to main burner	Noted

188 COMBUSTION AIR CONTROL

Primary Air Control Type	At burner mixer with air shutter	Noted
Secondary Air Control Type	Kenilworth Turbulator	Noted

189 HEATER PERMISSIVES

Bath LSLL Location	In external bridle.	Noted
Bath LSLL Type	Single point electric float	Noted
Bath LSLL Make	Kimray 2200 SLS ~ Class1-Zone1 ~ -40oC	Noted
Level Switch Orientation	Manual override button points down (enabled).	Noted
TSHH Location	In the main tank	Noted
TSHH Type	Thermocouple directly to BMS	Noted
TSHH Setpoint	215 deg C 419.00 deg F	Noted
TSHH Separate From TSH	Yes.	Noted
Fuel Gas PSLL Location	Upstream of SSVs.	Noted
Fuel Gas PSLL Type	Electric pressure switch	Noted
Fuel Gas PSLL Make	UE 12SHSN9A ~ 1-15psi range ~ Class1-Zone1 ~ -50oC	Noted
Fuel Gas PSLL Setpoint	20.7 kPag 3.0 psig	Noted
Fuel Gas PSHH Location	Downstream of SSVs	Noted
Fuel Gas PSHH Type	Electric pressure switch	Noted

APPLIANCE DATA

Page 5 of 7

Fuel Gas PSHH Make	UE 12SHSN9A ~ 1-15psi range ~ Class1-Zone1 ~ -50oC	Noted
Fuel Gas PSHH Setpoint	96.5 kPag 14.0 psig	Noted
Isolation Valves Installed on Pressure Switch PSHH	No isolation valve installed on permissive.	Noted
Isolation Valves Installed on Pressure Switch PSL	No isolation valve installed on permissive.	Noted
Plant ESD Connected	Yes.	Noted

190 HEATER BMS/FSG

BMS Type	Prepackaged / CSA 22.2 Certified.	Noted
BMS Make	Profire 2100 ~ CSA22.2 No.199-2007 ~ Class1-Zone2 ~ -40oC	Noted
Flame Sensor	Flame Rod	Noted
Remote BMS Connections	Interlocks to plant control system, ESD, Status	Noted
BMS Serial Number	1PS21-E0000-P14253	Noted
BMS Temperature Input	Dual K type thermocouples.	Noted
TSHH Interlocked with BMS	Yes.	Noted

192 HEATER CONTROL SYSTEM

Process Control Element Location	TE In the main tank	Noted
Process Controller Type	HI / LO / PILOT / OFF	Noted
Controller Temperature Setpoint	184 deg C 363 deg F	Noted
Pilot off	205 deg C 401 deg F	Noted
Process Controller Make	Temperature controlled via BMS.	Noted
TSH Type	Thermocouple directly to BMS	Noted
Fuel Low Fire Start	Reduced flow low-fire branch	Noted
Low Fire Start For System Over 1 MM Btuh	Yes.	Noted

193 HEATER MAIN FUEL TRAIN

Main Fuel Manual Shut-off Valve	Unified Alloys ~ Valtec-series ~ CGA 3.16 (option) ~ -60oC	Noted
Main Fuel Train Filter	Y-Strainer	Noted
Is Appliance Manual Fuel Shutoff Easily Accessible	Yes	Noted
Main Fuel PRV Configuration	Single main fuel PRV.	Noted
Appliance Main Fuel PRV	BelGas R627 ~ 1/2in. orifice ~ 5-20psi spring ~ 200/60+SP psi max inlet/outlet ~ -29oC	Noted
Appliance Fuel PRV Setpoint	89.6 kPag 13.0 psig	Noted
Appliance Fuel PSV Configuration	PSV integral to main PRV	Noted
Main Safety Shutoff Valve Configuration	Triple SSV with HI/LO fire branches	Noted
Main Safety Shutoff Valve Type	Electric Solenoid(s)	Noted
Main Safety Shutoff Valve Make (single valve)	ASCO HV298568002 24VDC ~ CSA 6.5-C/I ~ Class1-Zone1 ~ 35psi MOPD ~ 100psi MAWP ~ -40oC/-10oC High-Fire valve	Noted
Main Upstream Safety Shutoff Valve Make	ASCO HV298568002 24VDC ~ CSA 6.5-C/I ~ Class1-Zone1 ~ 35psi MOPD ~ 100psi MAWP ~ -40oC/-10oC	Noted
Main Downstream Safety Shutoff Valve Make	ASCO HV298568002 24VDC ~ CSA 6.5-C/I ~ Class1-Zone1 ~ 35psi MOPD ~ 100psi MAWP ~ -40oC/-10oC	Noted
Main SSV(s) Slow Opening	No	Noted
Main Burner Test Firing Valve	Unified Alloys ~ Valtec-series ~ CGA 3.16 (option) ~ -60oC	Noted
Are pressure gauge locations adequate	Yes.	Noted
Are pressure gauge ranges adequate	Yes.	Noted
Are pressure test points adequate	Yes.	Noted
Main Fuel Train Piping	Carbon steel piping	Noted

APPLIANCE DATA

Page 6 of 7

Sufficient unions / flanges for maintenance	Yes.	Noted
Is Piping Adequately supported	Yes.	Noted

194 HEATER PILOT FUEL TRAIN

Pilot Fuel Takeoff	From downstream of main regulator.	Noted
Pilot Fuel Manual Shut-Off Valve	Unified Alloys ~ Valtec-series ~ CGA 3.16 (option) ~ -60oC	Noted
Pilot PRV	Fisher 67CFR ~ 0-20psi spring ~ 250psi max inlet ~ -29oC	Noted
Pilot PRV Setpoint	40.7 kPag 5.9 psig	Noted
Pilot PSV Configuration	PSV integral to pilot PRV	Noted
Pilot PSV Setpoint	55 kPag 8.0 psig	Noted
Pilot SSV Configuration	Single SSV	Noted
Pilot SSV Type	Electric Solenoid(s)	Noted
Pilot SSV Make (single valve)	ASCO HV427246002 24VDC ~ CSA 6.5-C/I ~ Class1-Zone1 ~ 50psi max inlet ~ -40oC	Noted
Pilot Test Firing Valve	Unified Alloys ~ Valtec-series ~ CGA 3.16 (option) ~ -60oC	Noted
Are pressure gauge locations adequate	Yes.	Noted
Are pressure gauge ranges adequate	Yes.	Noted
Are pressure test points adequate	Yes.	Noted
Pilot Fuel Train Piping	Stainless steel tubing	Noted
Sufficient unions / flanges for maintenance	Yes.	Noted
Is Piping Adequately supported	Yes.	Noted

224 INSTALLATION - FLAMMABLE GAS VENTING

Vent Piping Materials	Carbon steel piping and stainless steel tubing	Noted
Is Sour Gas Vented	No	Noted
Are PSV's Vented Separately	Yes	Noted
Are Vent Line Connection Sizes to Devices Maintained	Yes	Noted
Are Combined Vents Increased in Size	Vents are not combined.	Noted
Are There Any Vent Lines Under The Building / Enclosure	No	Noted
Are Vent Terminations Away From Building Openings and Air Intakes	Yes	Noted
Are Any Vent Line Terminations Close to Operating Personnel	No	Noted
Are Vent Terminations Equipped With Screens	All required screens are properly installed.	Noted
Are Vent Line Terminations Protected From Water Entry	Yes	Noted
Is Piping Adequately Supported	Yes.	Noted

261 STACK READINGS

Source of Combustion Readings	Installer	Noted
Main Burner Pressure	90 kPag 13.0 psig	Noted
Process Temperature	182 deg C 360 deg F	Noted
Stack Temperature	413 deg C 776 deg F	Noted
Stack Oxygen	4.8 %	Noted
Stack CO	9 ppm	Noted
Stack NOx	50 ppm	Noted
Excess Air	26.5 %	Noted
Efficiency (HHV)	75.5 %	Noted

APPLIANCE DATA

Page 7 of 7

Stack Temperature Notes	High. Stack temp between 350-650oF/175-340oC above bath temp. Results in lower efficiency. Recommend review of the combustion design.	Recommend
Excess Air Notes	Adjustment of the burner and combustion air flow may be necessary. O2 is in the somewhat high range of 3.5-5.5% and results in lower efficiency Recommend review of the combustion design. Adjustment of the burner and secondary air flow may be necessary.	Recommend
Carbon Monoxide Notes	Less than 50 ppm is ideal	Noted
NOx Notes	Acceptable concentration, in the range of 30-50 ppm (3% O2 basis)	Noted
Efficiency Notes	Efficiency is acceptable in the range of 72 to 78%	Noted

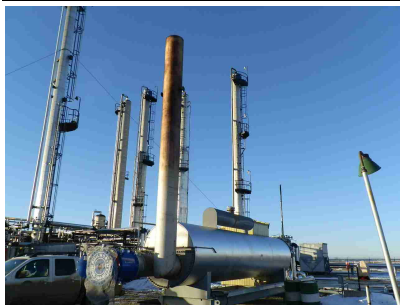
FIELD INSPECTION PHOTOS 20141219_1030

Appliance

Tag Number H-440
LSD 01-21-38-02-W5
Serial No. 2007-7738-01

Owner

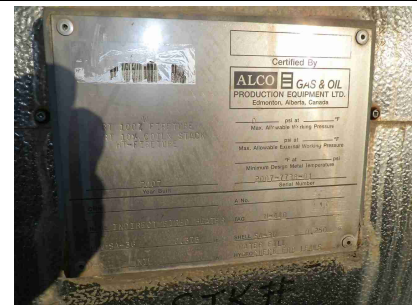
Company Husky Energy Inc.
Plant Sylvan Lake
Area



Overall view of appliance



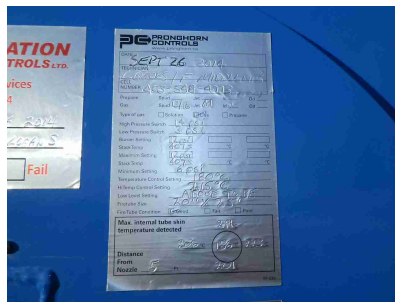
Lease sign



Appliance rating plate



System label



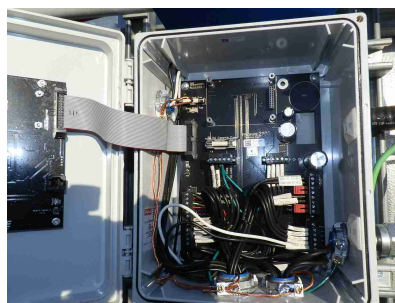
Burner Label



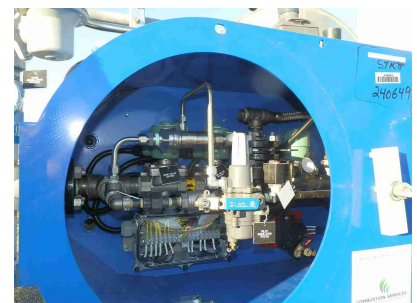
Burner Management System - BMS



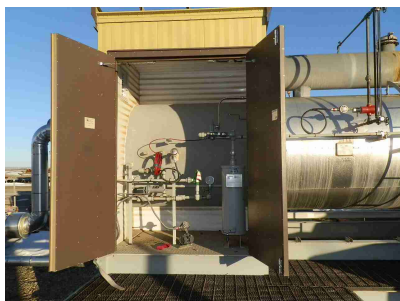
BMS Serial Number



BMS wiring



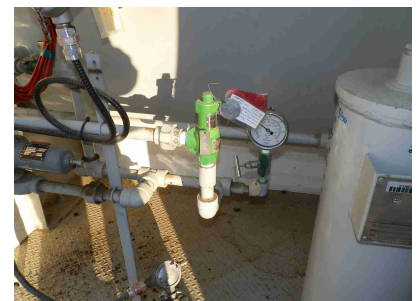
Overall view of fuel train



Fuel supply pressure



Upstream PRV



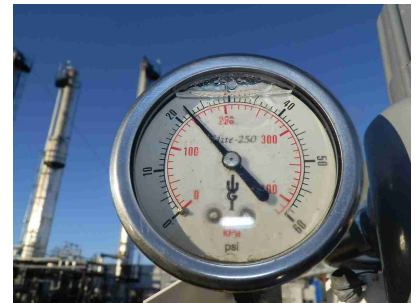
Main fuel scrubber



Upstream PSV



Upstream PRV - main fuel inlet pressure



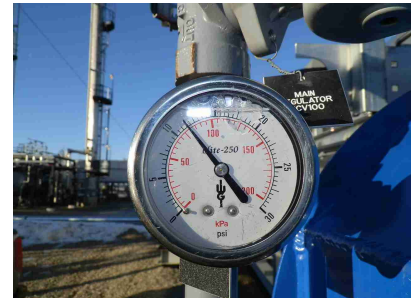
Main fuel inlet pressure gauge



Main fuel manual shutoff valve and y-strainer



Main fuel pressure regulator - PRV



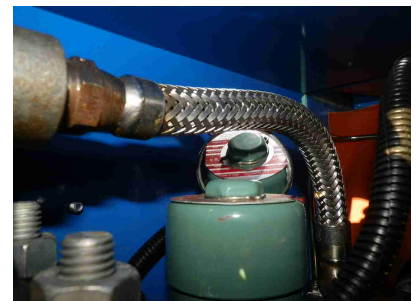
Main PRV pressure gauge



Low pressure shutdown - PSLL



Main fuel safety shutoff valve - SSV



High-fire solenoid



High pressure shutdown - PSHH



Pilot fuel train take-off



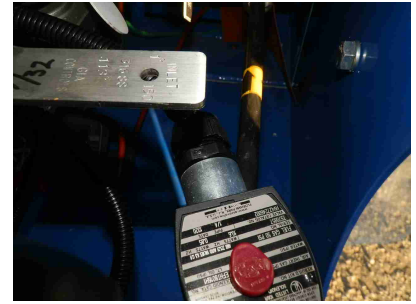
Pilot manual fuel shutoff valve



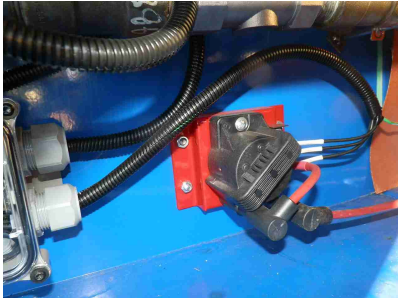
Pilot pressure regulator - PRV



Pilot PRV pressure gauge



Pilot safety shutoff valve - SSV



Ignition transformer



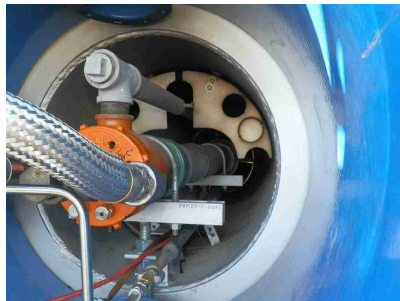
Main burner test firing valve



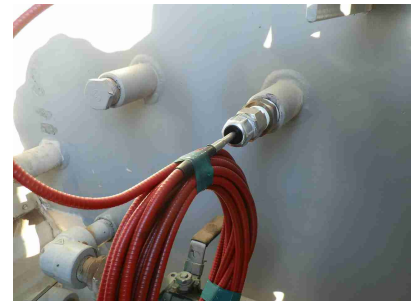
Pilot burner test firing valve



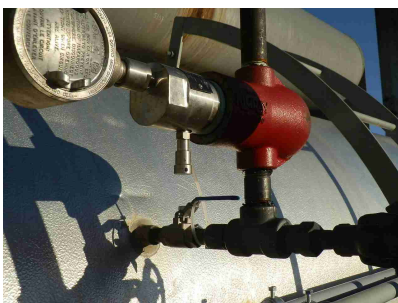
Flame cell



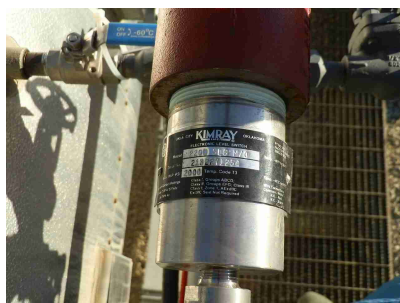
Main burner and pilot close-up



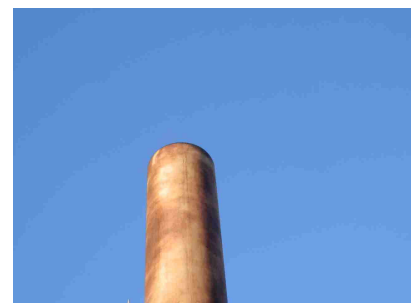
TSH and TSHH - dual thermocouple



LSLL - Low bath fluid shutdown



LSLL - Low bath fluid shutdown



Stack



Stack sampling port



Vent line terminations



Vent line terminations

BILL OF MATERIALS

20141219_1030

BOM: BM1411034 Design Code Field Approval Design Code: O1-U5_2011_HP_PILOT_PF_24

NFN Number	NFN1411034	Product Type	Design Code Field Approval		
O1-U5_2011_HP_PILOT_PF_24		Project Status	Appliance Approved		
Inspected By	Garth Blades	Owner	Husky Energy Inc.	LSD	01-21-38-02-W5
Inspected	12/14/2014	Plant	Sylvan Lake	Tag	H-440
Prepared By	Christopher Pascua BSc	Area		Serial	2007-7738-01
Reviewed By	Rodger Talstra P.Eng.	Contact	Kenneth Westergaard	Phone	778-484-3974
Tag Number	Component Function	Connection	Description	Compliance Statement	Comments

BMS Burner Management System

BMS100	Burner Management System	N/A	Profire 2100 Ignition Flame Safety Controller, 10-30 VDC power input	CSA Certified C22.2-199, Class 1, Zone 2 Approved CSA 213-92	Incorporates process temperature controller, low and high fire outputs, and TS logic functions (see manual for details): TAL101 - low alarm on TSH101 - high fire output off TSHH101 - low fire output off TSHH102 - pilot output off TAHH103 - BMS off, reset
IGN100 BE100	Main Burner Ignitor / Flame Rod	N/A	Profire flame rod / ignitor	Accepted based on past performance	Part of the BMS supply
IGX100	Main Burner Ignition Transformer	N/A	Profire Ignition Transformer, 10-30 VDC	Accepted based on past performance	Part of the BMS supply. Ignition transformer to be mounted inside the windbox housing, non-hazardous classified area

CTR Control System

TE100 TE101	Dual Temperature Element HI/HIHI	1/2" MNPT	Wika 1000 dual element K-type thermocouple, Class I Div 2 head	Accepted based on good engineering practice	Both elements to be wired to controller
LSLL100	Level Switch LOLO	2" MNPT	Kimray Model CEC2, 2200 SLS, Level Switch c/w manual override button SPDT, CSA22.2, 2A 50VDC, 2000 PSI SWP, 316SS body, 316SS float, -50°F to 350°F (-45°C to 176°C)	CSA Approved Class 1 Zone 1	Mount with test button pointing down
TUB621	Instrument Tubing	3/8" OD	ASTM A269 316SS seamless tube, 0.035" wall thickness	ASTM A269	

BILL OF MATERIALS

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BOM: BM1411034 Design Code Field Approval Design Code: 01-U5_2011_HP_PILOT_PF

Tag Number	Component Function	Connection	Description	Compliance Statement	Comments
MBR Burner Equipment					
BRN100	Main Burner	1"	Kenilworth Natural Draft 3" Flame Scavenger Burner Complete with: support legs, nozzle, mixer, barrel, electrode, electrode bracket	Accepted based on past performance, testing and manufacturer's recommendation	
BRPL207	Main Burner Secondary Air Plate		Secondary air control fixed plate with holes at burner nozzle	Accepted based on past performance and testing	
MTR Main Fuel Train					
HV100	Main Fuel Manual Shut-off Valve	1" FNPT	Unified Alloy - Valtec C3371-14 1" NPT ball valve, 316SS, CGA 3.16 approved and marked	CSA Listed CGA 3.16 Compliant	
YS100	Main Train Y-Strainer	1" NPTF	Alta YS3000-L101, 1" Y-strainer, 3000#, A350 GR. LF2, 304SS screen with 1/32" perforations, -45C to 38C, c/w plug	Accepted based on good engineering practice	
PCV100	Main Pressure regulator	1" FNPT	1" NPT Belgas Model R627, Part No. R627-10, internal pressure relief valve, steel body, nylon seat, aluminum trim, 1/2" orifice, 5-20 PSI spring, "NACE"	CSA non-certified, Variance applied.	Accepted based on past performance and manufacturer's specifications
PI100	Main Burner Pressure Gauge	1/4" MNPT	WGI Series ELITE 250, Part No. WJ7446P, 2-1/2" dial, 304SS case, 316SS tube & socket, silicone filled, back mount connection, 0-60 PSIG, -60-70C	Accepted based on past performance and manufacturer's recommendations	
PSLL100	Main Burner Gas Pressure Switch Low-Low	1/2" FNPT	UE Spectra, Part No. 12SHSN9A, stainless steel welded diaphragm, 1-15 psig, -50C to 95C	CSA C22.2 Approved Class 1 Zone 1	Switch setpoint 50% of maximum burner pressure. Note: switch isolating valve is not recommended but can be accepted if locked and tagged.
SSV100	Main Burner Upstream Safety Shutoff Valve	1" FNPT	1" ASCO solenoid valve, Part No. HV298568-002, 316SS, 24VDC, peak and hold 23.6W peak/1W holding power, 35 PSIG MOPD, 100psi MAWP, -40°F ambient design, NACE compliant	CSA Listed CSA 6.5-2005 C/I Listed CRN 0C07487.2	Valve solenoid to be mounted upright

BILL OF MATERIALS

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BOM: BM1411034 Design Code Field Approval Design Code: 01-U5_2011_HP_PILOT_PF

Tag Number	Component Function	Connection	Description	Compliance Statement	Comments
MTR Main Fuel Train					
SSV101	Main Burner Downstream Safety Shutoff Valve	1" FNPT	1" ASCO solenoid valve, Part No. HV298568-002, 316SS, 24VDC, peak and hold 23.6W peak/1W holding power, 35 PSIG MOPD, 100psi MAWP, -40°F ambient design, NACE compliant	CSA Listed CSA 6.5-2005 C/I Listed CRN 0C07487.2	Valve solenoid to be mounted upright
SSV102	Main Burner Low Fire Solenoid Valve	1" FNPT	1" ASCO solenoid valve, Part No. HV298568-002, 316SS, 24VDC, peak and hold 23.6W peak/1W holding power, 35 PSIG MOPD, -40°F ambient design, NACE compliant	CSA Listed CSA 6.5-2005 C/I Listed CRN 0C07487.2	Valve solenoid to be mounted upright
PSHH100	Main Burner Gas Pressure Switch Low-Low	1/2" FNPT	UE Spectra, Part No. 12SHSN9A, stainless steel welded diaphragm, 1-15 psig, -50C to 95C	CSA C22.2 Approved Class 1 Zone 1	Switch setpoint 50% of maximum burner pressure. Note: switch isolating valve is not recommended but can be accepted if locked and tagged.
PI102	Main Burner Pressure Gauge	1/4" MNPT	WGI Series ELITE 250, Part No. WJ7446P, 2-1/2" dial, 304SS case, 316SS tube & socket, silicone filled, back mount connection, 0-60 PSIG, -60-70C	Accepted based on past performance and manufacturer's recommendations	
HV102	Main Burner Test Firing Valve	1" FNPT	Unified Alloy - Valtec C3371-14 1" NPT ball valve, 316SS, CGA 3.16 approved and marked	CSA Listed CGA 3.16 Certified	Mount as close as possible to the burner (on the burner windbox)
PIP603	Small Ø Regular Piping	<=1.5"	Sweet Service, ASTM A106 Gr.B seamless, sched 80, ANSI 150# rating @ -28°C, no short nipples	ASTM A333 Grade 6 SMLS	
FTG613	Regular 2000# Fittings	all	ASTM A105, 2000#, ANSI 150# rating @ -28°C	ASTM A105	
TUB622	Main/Pilot Tubing	see comments	ASTM A269 316SS seamless tube, 0.035" wall thickness	ASTM A269	May be used for the main or pilot fuel train. Size according to maximum flow, minimum 3/8" for pilot and 1/2" for main.


BILL OF MATERIALS


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BOM: BM1411034 Design Code Field Approval Design Code: 01-U5_2011_HP_PILOT_PF

Tag Number	Component Function	Connection	Description	Compliance Statement	Comments
PBR Pilot Burner					
BRN101	Pilot Burner	1/4"NPT	Kenilworth Burner Pilot Nozzle, c/w 1/2" fixed venturi style air mixer	Accepted based on manufacturer's documentation	
PTR Pilot Fuel Train					
HV101	Pilot Fuel Manual Shut-off Valve	1/4" FNPT	Unified Alloy - Valtec C3371-14 1/4" NPT ball valve, 316SS, CGA 3.16 approved and marked	CSA Listed CGA 3.16 Certified	
PCV101	Pilot Pressure Regulator	1/4" FNPT	1/4" Fisher 67CFR regulator with internal relief, tapped bonnet, 0-20 PSI spring, "Alberta sour", NBR elastomers, -29°C design	CSA non-certified, Variance applied, Acceptable based on past performance	
SSV103	Pilot Safety Shutoff Valve	1/4" NPTF	1/4" ASCO solenoid valve, Part No. HV427246-002, 316SS, peak and hold 10.6W peak/0.85W holding power, 24VDC, 4 H coil, 50 PSIG MOPD, -40°F design, NACE compliant	CSA Listed CSA 6.5-2005 C/I Listed CRN OC07487.2	Valve solenoid to be mounted upright
PI102	Pilot Burner Pressure Gauge	1/4" MNPT	WGI Series ELITE 250, Part No. WJ7446P, 2-1/2" dial, 304SS case, 316SS tube & socket, silicone filled, back mount connection, 0-60 PSIG, -60-70C	Accepted based on past performance and manufacturer's recommendations	
HV103	Pilot Test Firing Valve	1/4" FNPT	Unified Alloy - Valtec C3371-14 1/4" NPT ball valve, 316SS CGA 3.16 approved and marked	CSA Listed CGA 3.16 Certified	
PIP603	Small Ø Regular Piping	<=1.5"	Sweet Service, ASTM A106 Gr.B seamless, sched 80, ANSI 150# rating @ -28°C, no short nipples	ASTM A333 Grade 6 SMLS	
FTG613	Regular 2000# Fittings	all	ASTM A105, 2000#, ANSI 150# rating @ -28°C	ASTM A105	
TUB622	Main/Pilot Tubing	see comments	ASTM A269 316SS seamless tube, 0.035" wall thickness	ASTM A269	May be used for the main or pilot fuel train. Size according to maximum flow, minimum 3/8" for pilot and 1/2" for main.

RATING PLATE						20141219_1030
NFN Number	NFN1411034	Product Type	Design Code Field Approval			
Design Code	O1-U5_2011_HP_PILOT_PF_2	Project Status	Appliance Approved			
Inspected By	Garth Blades	Owner	Husky Energy Inc.	LSD	01-21-38-02-W5	
Inspected	12/14/2014	Plant	Sylvan Lake	Tag	H-440	
Prepared By	Christopher Pascua BSc	Area		Serial	2007-7738-01	
Reviewed By	Rodger Talstra P.Eng.	Contact	Kenneth Westergaard	Phone	778-484-3974	

GAS FIRED APPLIANCE RATING PLATE	
 <div> Kenilworth Combustion SE-6-51-5-W4M, Vermillion, AB, T9X 2B4 </div>	
Appliance Manufacturer	Alco Gas & Oil Production Equipment Ltd.
Location Built In	Edmonton AB
Built Date	2007
Appliance Serial Number	2007-7738-01
New Install or Upgrade	Upgrade
Installation Company	Kenilworth Combustion
Installed Date	September 2014
Installation Project Number	11667
Appliance Type	Line Heater
Location LSD	01-21-38-02-W5
Elevation Above Sea Level	3225 ft 983 m
Appliance Tag Number	H-440
Ambient Temperature Min	-29 deg C -20 deg F
Ambient Temperature Max	40 deg C 104 deg F
Main Fuel Type	Process Gas
Main Fuel Quality	Sweet Dry
Secondary Fuel Type	Not approved for secondary fuel use
Pilot Fuel Type	Process Gas
Pilot Fuel Quality	Sweet Dry
Pilot Fuel Inlet Pressure	89.6 kPag 13.0 psig
Appliance Max Fuel Input (HHV)	2.34 GJ/h 2.21 MM Btuh
Number of Burners per Appliance	1
Maximum Burner Pressure	89.6 kPag 13.0 psig
Minimum Burner Pressure	6.9 kPag 1.0 psig
Pilot Pressure	40.7 kPag 5.9 psig
Electrical Area Class At Burner	Unclassified
Electrical Area Class At Fuel Train	Unclassified ~ Kenilworth windbox
Electrical Area Class At Control Panel	Class 1 Zone 2
Main Power	120 VAC / 60 Hz 15 amps
Primary Control Power	24 VDC 5 amps

GAS FIRED APPLIANCE FIELD APPROVAL	
	
ENEFEF ENERGY EFFICIENCY ENGINEERING LTD. Field Approval Number: NFN1411034 Approval Date: 18 Dec 2014 Approved By: Jozef Jachniak, P. Eng.	
<p>ENEFEF is accredited by the Standards Council of Canada as an Inspection Body for gas-fired appliances and equipment. Gas and electrical safety evaluation based on Canadian codes requirements outlined in CAN-P-1608 Appendix C. This approval represents the results of a single field inspection and is not a product certification. This approval is void if this appliance is altered or relocated.</p> <p>ENEFEF est accrédité par le Conseil Canadien des Normes en tant qu'Organisme d'Inspection pour les appareils et équipement à gaz. L'évaluation de la sécurité du gaz et électrique est basée sur les exigences des codes canadiens énoncés à l'annexe C du CAN-P-1608. Cette approbation représente les résultats d'une seule inspection sur le terrain et ne constitue pas une certification du produit. Cette approbation est nulle si cet appareil est modifié ou déplacé.</p>	

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www.ENEFEF.com

FUEL COMPOSITION REPORT 20141219_1030

Prepared By Christopher Pascua BSc
Reviewed By Rodger Talstra P.Eng.

Client/Consultant Kenilworth Combustion
Contact Kenneth Westergaard
Email kwestergaard@kenilworth.ca
Tel 778-484-3974
Cell 250-826-3974
Fax
Owner / Operator Husky Energy Inc.

Plant Sylvan Lake
Area
Elevation 3225 ft | 983 m
Jurisdiction AB
Process Gas Plant
Function Indirect Fired Gas Heating
Appliance Line Heater
Appliance Tag H-440
LSD 01-21-38-02-W5
Serial Number 2007-7738-01

Fuel Usage	Pilot Fuel	Main Fuel
Fuel Type	Process Gas	Process Gas
Fuel Info Source	Estimated	Estimated
Fuel Temperature C/F	15.6 / 60.1	15.6 / 60.1
C1 Methane	0.9300	0.9300
C2 Ethane	0.0600	0.0600
C3 Propane	0.0020	0.0020
C4 Butane	0.0000	0.0000
C5 Pentane	0.0000	0.0000
C6 Hexane	0.0000	0.0000
C7 heptane	0.0000	0.0000
C8 as Octane	0.0000	0.0000
C6H6 Benzene	0.0000	0.0000
H2S Hydrogen Sulfide	0.0000	0.0000
CO Carbon Monoxide	0.0000	0.0000
H2 Hydrogen	0.0000	0.0000
S Sulfur Vapor	0.0000	0.0000
COS Carbonyl Sulfate	0.0000	0.0000
CS2 Carbon Disulfide	0.0000	0.0000
CH3S2 Dimethyl Disulfide	0.0000	0.0000
CH3SH Mercaptan	0.0000	0.0000
O2 Oxygen	0.0000	0.0000
N2 Nitrogen & Inert	0.0050	0.0050
CO2 Carbon Dioxide	0.0030	0.0030
SO2 Sulfur Dioxide	0.0000	0.0000
H2O Water Vapor	0.0000	0.0000
Molecular Weight MW	17.0834	17.0834
Fuel Density lb/ft3 kg/m3	0.045 0.7245	0.045 0.7245
Specific Volume ft3/lb m3/kg	22.109 1.3803	22.109 1.3803
Specific Gravity	0.5910	0.5910
Specific Heat Btu/lb/degF kJ/kg/degC	0.5081 2.1274	0.5081 2.1274
Sulfur Content By Weight	0.0000	0.0000
HHV English Btu/scf Btu/lb	1052.9 23316	1052.9 23316
HHV Metric MJ/m3 MJ/kg	39.23 54.23	39.23 54.23
LHV English Btu/scf Btu/lb	949.6 21028	949.6 21028
LHV Metric MJ/m3 MJ/kg	35.38 48.91	35.38 48.91
Combustion O2 ft3/ft3	2.0800	2.0800
H2O in POC ft3/ft3	2.0480	2.0480
CO2 in POC ft3/ft3	1.0590	1.0590
N2 in POC ft3/ft3	7.8772	7.8772
SO2 in POC ft3/ft3	0.0000	0.0000

