

ATTACHMENT W

Kinder Morgan Inc
2SLB, 3500 HP Unit

Engine Cost Analysis	Interest Rate:	3.25%
All Units	Period (yrs):	20

Cost Effectiveness Summary using Stack Test Data Emission Factors

Control Equipment	Unit	Capital Cost	Total Annual Cost*	Emission Reduction	Cost Effectiveness
		(\$)	(\$)	(tpy)	(\$/ton)
Oxidation Catalyst	2SLB Example	321,742	70,115	8.4	8,299

* Total Annual Cost includes the annualized capital cost.

El Paso Natural Gas Company, LLC

2SLB, 3500 HP Unit

	Interest Rate:	3.25%	
	Period (yrs):	20	<-- EPA Air Pollution Control Cost Manual
Base Case			
VOC lb/hr:	3.86 lb/hr	Based on 0.5 g/hp-hr VOC average emission rate	
VOC tpy:	16.90 tpy	Calculated based on annual hours of:	8760
Controlled Retrofit			
VOC lb/hr:	1.93 lb/hr	0.5 g/bhp-hr * 3500 HP * (50% DRE of Oxidation Catalyst)	
VOC tpy:	8.45 tpy	Calculated based on 8760 hours/year	
Total Capital Investment	\$ 321,742	<-- EPNG Cost Estimate of just the exhaust equipment, does not include installation.	
Annualized TCI:	\$ 22,129	<-- Based on interest rate, year and TCI	
Annual Admin, Taxes, Insurance Cost:	\$ 12,870	<-- Per EPA Air Pollution Control Cost Manual, 7th Ed, annual admin, taxes, and insurance costs are 4% of TCI	
Annual Operator Cost	\$ 6,000	<-- Assume 100 hr/yr maintenance required at \$60/hr	
Annual Steam Wash Cost	\$ 2,698	<-- Assume 2 steam wash at a cost of \$4928/wash every 32,000 hours	
Annual Catalyst Replacement Costs:	\$ 26,418	<-- Based on quote from vendor, replacement every 32,000 hours	
Total Annual Cost:	\$ 70,115		
Emissions Reduction:	8.4 tpy		
Cost Effectiveness:	\$ 8,298.57	\$/ton	



November 14, 2018

KINDER MORGAN
1001 Louisiana Street
Houston, Texas

Attention:



Subject: Station No. 307 Exhaust Stack
Exhaust Converter Silencer for Worthington ML-12 Engine



Dear :

In response to your request, we are pleased to submit our proposal for your review and consideration.

Item A:  Vertical Exhaust Converter Silencer with following features:

- Two 24"-125# ANSI Drilled low side flanged inlet connections (88" inlet C.L. elevation)
 - 48"Nominal Diameter top outlet plate flange connection
 - Three-Chambered Reactive Type Silencer with vent holes in baffles per DOT 192.
 - Integrated 304SS oxidation catalyst section includes (12) catalyst elements and (12) guard elements to protect catalyst from lube oil carryover.
 - Catalyst rated to provide 75% CO reduction and 50% VOC reduction (min) through exhaust gas temperature range (450°F to 650°F).
 - Two (2) 1" NPT Temperature Ports (upstream & downstream of catalysts) and Two (2) 1" NPT Pressure Ports (upstream & downstream of catalysts).
 - (2) 36" Flanged Manways (catalyst access) with bolted/hinged blinds for ground level access.
 - 1" NPT Drain Pipe with Cap head.
 - Integral skirt & base ring vertical support.
 - 48"OD x 120" Long Tailpipe with two 2"-3000# coupling sampling ports and lifting lugs. Flange gasket and bolting is included.
 - The silencer and components are of all welded construction with 3/8" thick SA-516-70 carbon steel shell and heads, continuous-strand fiberglass acoustic pack.
 - The exterior is blast cleaned per SSPC-SP10 and coated with two coats of Carboline Thermaline Heat Shield (grey color) per paint manufacturer's specifications.
 - For maximum specified exhaust gas flow rate of 62,000 pph at 650°F, the pressure drop across the silencer including the stack and exit loss is 5.8" w.c.
 - Assembly designed for 1000°F and wind load per 2012 IBC, Includes PA PE Stamp.
- Silencer Dimension: 84.75" OD x 252"Lg x 18,200 lbs.
Tailpipe Dimensions: 48" OD x 120 1/2"Lg x 1,600 lbs.
Assembly: 372 5/8" O.A.H. (with 1/8" stack gasket) x 19,800 lbs.

PRICE SUMMARY:

Item A: Exhaust Converter Silencer with Tailpipe Price
\$ 219,238 Net

Item B: Freight to deliver Item A scope to job site in Marienville, PA\$ 6,000 Net

SPARES:

Item C: Set of twelve (12) Spare Catalyst Elements
\$ 63,168 Net

Item D: Set of twelve (12) Spare Guard Elements
\$ 30,816 Net

Item E: Set of twenty-four (24) Gaskets for Catalyst & Guard Elements
\$ 2,520 Net

OPTIONS:

Item F: Thermal Insulation Blanket System to cover lower 120" length of 141-30B-XXX main silencer shell, recommended to maintain exhaust gas temperature at low temperature off load operating conditions. Includes 2.5" thick thermal blanket sections, stainless steel wire twists, custom sized manway blanket covers, wire nuts welded to the silencer shell, and installation assembly drawing to facilitate field installation by others.

The core blanket is a glass fiber felt thermal insulation per ASTM C 1086-88.

The jacketing material consists of a layer 304SS knitted wire mesh (0.011" Dia. @ 16 SF/LB), an outer layer of silicone impregnated fiberglass composite material (601 g/m²).

.....\$ 14,803 Net

Item G: Aluminum Heat Sheeting for 8 feet above concrete.

Includes corrugated Aluminum Sheets, support clips, stand-off rings, fasteners and drawing to facilitate Field installation by others.

.....\$ 3,239 Net

Item H: Aluminum Heat Sheeting for Silencer Body, 19'-6" above concrete.

Includes corrugated Aluminum Sheets, support clips, stand-off rings, fasteners and drawing to facilitate Field installation by others.

.....\$ 6,964 Net

Please refer to the attached preliminary proposal sketch. If this project goes forward at a later date, the base ring anchor bolt pattern will require site confirmation as it is not clear from the provided drawings.

Additional Performance Comments:

1. The proposed exhaust silencer is designed to provide a minimum of 35 to 40 dB Overall Exhaust Noise Reduction.
2. The proposed exhaust silencer is designed to meet or exceed the minimum DIL (in each octave band) for this engine application as noted in the table below.

DIL Values in dB per Octave-Band Center Frequency for Proposed Exhaust Silencer

Octave band Center Frequency (Hz)									
Octave band Center Frequency (Hz)	31.5	63	125	250	500	1000	2000	4000	8000
Guarantee (dB)	30	37	42	44	48	51	50	48	42

3. For minimum specified exhaust gas flow rate of 54,000 pph at 450°F, the pressure drop across the silencer including the stack and exit loss is 3.9" w.c.

Commercial Notes:

1. Prices are [REDACTED]
2. Prices are firm until December 31, 2018.
3. Progress payments may be required (to be negotiated).
4. Current shipment is 13 to 14 weeks ARO (subject to prior sales and drawing approval if required).
5. [REDACTED] will submit outline drawings for approval 1 weeks after receipt of a purchase order. Please feel free to mark-up and return the included proposal sketch with an order to expedite the approval process.
6. Limited Warranty per [REDACTED] Terms and Conditions of Sale (attached).

Thank you for the opportunity to quote on this project. If you have any further questions concerning our offering or if we may be of any additional assistance, please contact us.

Very truly yours,

[REDACTED]

Cc:

[REDACTED]

[REDACTED]