GE Oil & Gas - HSR Compressor Performance Report

Project Name: Core Mark #2
Customer/End -user: GAIN Clean Fuel / Core Mark
Packager: CMD Corp
Site Location: Forrest City, AR

Quote #: CMD08
Case #: n/a
Version: 02.02.00
Date: 2/24/2014, 3:34:10 PM

Application Data:		Compressor Frame: H302		Driver Data:		Site Data:	
Est. Flow::	474.866 ft^3/mi	Rated Power:	200.0 HP	Type:	Motor	Elevation:	253.0 ft
Load/Flow:	0.4 HP/ft^3/min	Stroke:	3.000 in	Manufacturer:	GE	Atm. Pressure:	14.5607 psiA
Est. Total Load:	185.2 HP (93%)	Rated Speed:	1800	Model:	5KS447XAA2036	Ambient Temp:	70.0 deg F
Run Speed:	1785	Rod Diameter:	1.125 in	Rated Power:	200.0 HP	Gas Method:	Generic
Auxiliary Load:	0.0 HP(c)	Max Rod Load Comp:	10000 lbf	Rated Speed:	1800	Base Conditions for Flow Rates:	
Lubrication:	Lubed	Max Rod Load Tens:	10000 lbf	Avail. Power:	198.3 HP	Pressure:	14.6960 psiA
Type:	CNG (GNC)	Max Rod Load Gas:	10000 lbf	Amb. Derate:	Fixed	Temperature:	60.0 deg F

ISSUES:
Project Notes: No Gas Analysis Entered,
Case Notes:
Order Status:

Stage/Service Data:

		Stage-1	Stage-2	Stage-3	Stage-4
Flow Rate:	ft^3/min	474.87	474.87	474.87	474.87
Load:	HP	41.2	49.3	48.6	40.2
Specific Gravity:	-	0.5818	0.5818	0.5818	0.5818
K Value (Cp/Cv):	-	1.3038	1.3038	1.3038	1.3038
Zs:	-	0.9911	0.9826	0.9499	0.8821
Zd:	-	0.9906	0.9853	0.9737	1.0270
Suction Press.:	psiG	60.00	172.75	552.15	1736.88
Ps@Flange:	psiG	56.00	172.75	552.15	1736.88
Pd@Flange:	psiG	177.75	557.15	1741.88	4510.00
Discharge Press.:	psiG	172.75	552.15	1736.88	4500.00
Compress. Ratio:	-	2.7255	3.0522	3.0994	2.5833
Suction Temp.:	deg F	80.0	125.0	125.0	125.0
Cooler Temp.:	deg F	125.0	125.0	125.0	n/a

Cylinder Data:

		Throw-1	Throw-2	Throw-3	Throw-4	Throw-5	Throw-6
Model:	-	H-Series	H-Series				
Operating Mode:	-	D/A Cyl	D/A Cyl				
Head End	Stage	Stg-4	Stg-1	-	-	-	-
Bore:	in	1.5	8	-	-	-	-
MAWP:	psiG	6000	300	-	-	-	-
RDP:	psiG	5455	273	-	-	-	-
Tail Rod Dia:	in	0	0	-	-	-	-
Est. Td:	deg F	280.4	235.2	-	-	-	-
VVCP Open:	in : Turns	No VVCP	No VVCP	-	-	-	-
Base Clr:	%	32.61	18.91	-	-	-	-
Added Clr:	%	0.00	7.92	-	-	-	-
Total Clr:	%	32.61	26.83	-	-	-	-
Vol. Eff. Suct.:	%	72.97	66.71	-	-	-	-
Vol. Eff. Disch.:	%	41.03	30.90	-	-	-	-
Flow:	ft^3/min	474.77	474.87	-	-	-	-
Crank End	Stage	Stg-3	Stg-2	-	-	-	-
Bore:	in	3	5	-	-	-	-
MAWP:	psiG	2500	1250	-	-	-	-
RDP:	psiG	2273	1136	-	-	-	-
Est. Td:	deg F	313.3	312.2	-	-	-	-
Base Clr:	%	19.90	18.14	-	-	-	-
Added Clr:	%	0.00	0.00	-	-	-	-
Total Clr:	%	19.90	18.14	-	-	-	-
Vol. Eff. Suct.:	%	70.97	72.74	-	-	-	-
Vol. Eff. Disch.:	%	30.55	30.99	-	-	-	-
Flow:	ft^3/min	474.84	474.87	-	-	-	-
Valve Spacers:	HE#/CE#	0 / 0	2 / 0	-	-	-	-
Rod Loads							
Gas-Compress.:	%	81.3	47.1	-	-	-	-
Gas-Tension:	%	50.9	97.8	-	-	-	-
Net-Compress.:	%	62.1	26.8	-	-	-	-
Net-Tension:	%	26.2	74.7	-	-	-	-
Pin Reversal:	Deg/Mag%	n/a	n/a	-	-	-	-
Throw Loading	HP	88.7	90.5	-	-	-	-

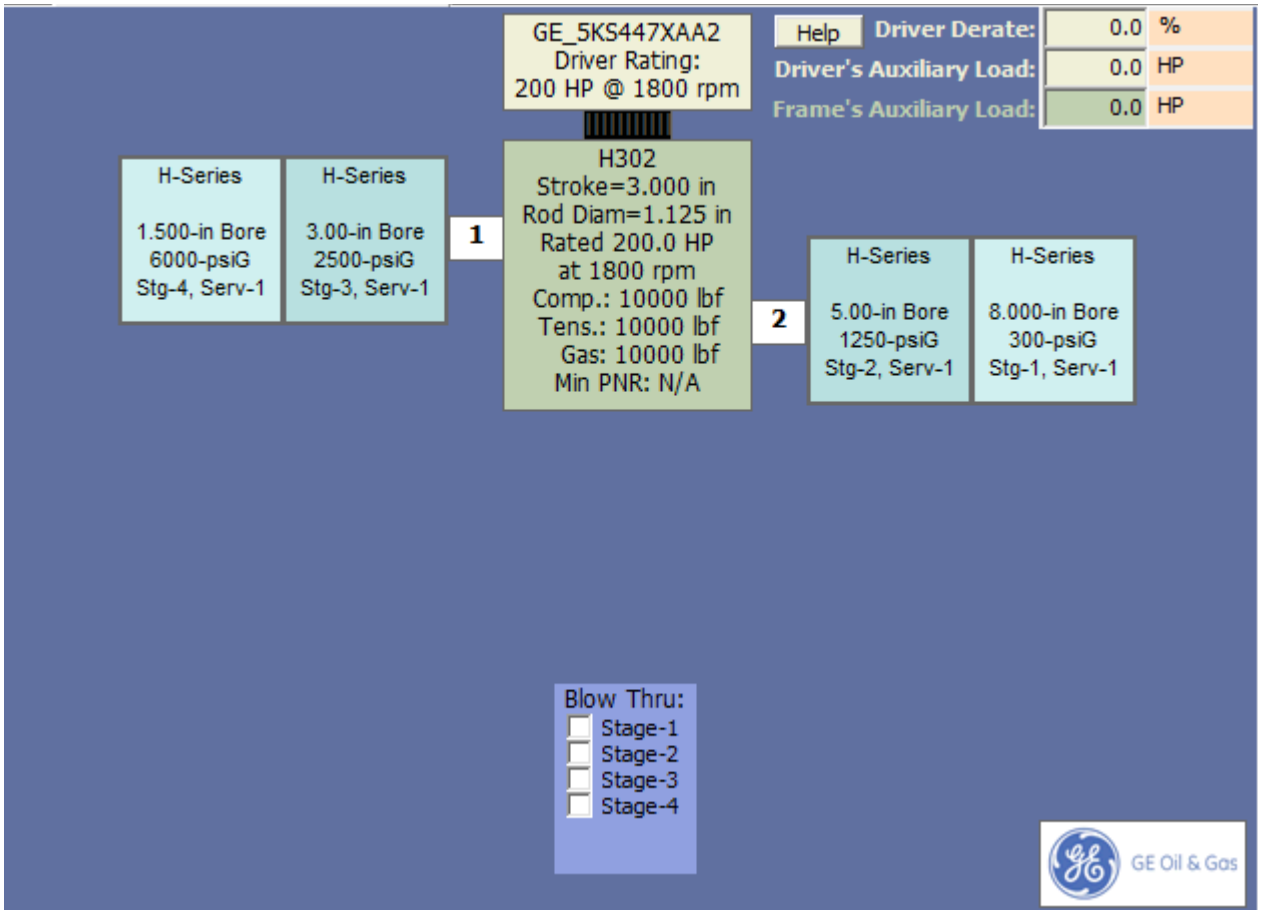
BOLD = *Out of Limit* **FILE**: Corfe Mark #2 Conditions.hsr

GE Oil & Gas - HSR Compressor Unit Diagram Report

Project Name: Core Mark #2
Customer/End-user: GAIN Clean Fuel / Core Mark
Packager: CMD Corp
Site Location: Forrest City, AR

Quote #: CMD08
Case #: n/a
Version: 02.02.00
Date: 2/24/2014, 3:34:11 PM

API Notes: No Standard
Non-Lubed: False
Distance Pieces: Throw#1 Type-1/A, Throw#2 Type-1/A



GE Oil & Gas - HSR Compressor Mass Elastic Report

Project Name: Core Mark #2
Customer/End-user: GAIN Clean Fuel / Core Mark
Packager: CMD Corp
Site Location: Forrest City, AR

Quote #: CMD08
Case #: n/a
Version: 02.02.00
Date: 2/24/2014, 3:34:14 PM

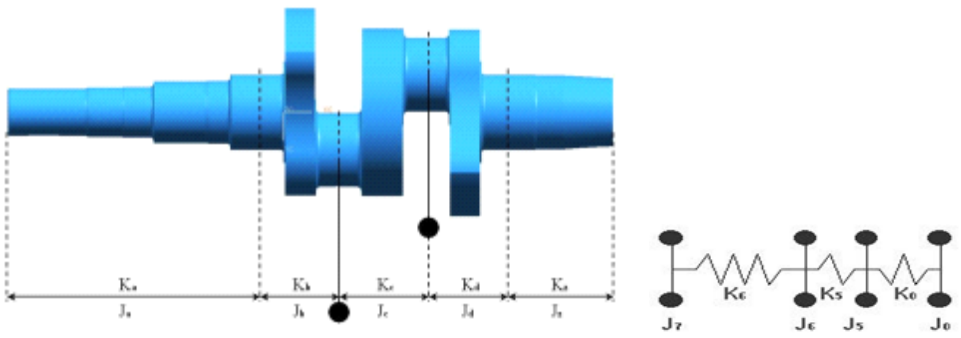
H302	Units	Throw#1	Throw#2	Throw#3	Throw#4	Throw#5	Throw#6
CYLINDER							
HE Bore Dia	in	1.500	8.000				
CE Bore Dia	in	3.000	5.000				
HE/CE Stage		4 / 3	1 / 2				
WEIGHTS							
Piston & Rod	lbm	14.91	21.96				
Crosshead*	lbm	11.99	11.99				
Wrist Pin	lbm	2.37	2.37				
Balancing	lbm	7.05	0.00				
ConRod Rot.	lbm	8.36	8.36				
ConRod Rec.	lbm	5.42	5.42				
Mrec_th:	lbm	41.74	41.74				

** Weights shown in the Crosshead row do not include the weight of the Wrist Pin. Total Crosshead Weight = Crosshead* + Wrist Pin*

MASS POLAR MOMENT OF INERTIA (MPMOI)			
Jcs_th	lbm-in2	128.44	136.62
Jcw	lbm-in2	NA	NA
Jcr	lbm-in2	18.81	18.81
Jrec_th	lbm-in2	93.91	93.91
Jrot_th	lbm-in2	147.25	155.43

Mrec_th: *Reciprocating Parts Total Mass;* ***Jcs_th:*** *Crankshaft equivalent MPMOI;* ***Jcw:*** *MPMOI of Counterweight relative to Crankshaft Axis;* ***Jcr****: MPMOI of Connecting Rod Rotating Part;* ***Jrec_th:*** *MPMOI of Reciprocating Parts;* ***Jrot_th:*** *MPMOI of Rotating Parts.*

Inertia	*lbm-in2*	Stiffness	*lbf-in/rad*	Inertia	*lbm-in2*	*lbm-in-sec2*	Stiff.	*lbf-in/rad*
Ja=	7.82	**Ka=**	1.90143e+07	**J7=**	7.82	0.02023	**K7=**	0.00000e+00
Jb=	78.16	**Kb=**	3.17956e+07	**J6=**	188.45	0.48770	**K6=**	1.18987e+07
Jc=	100.57	**Kc=**	3.92503e+07	**J5=**	196.86	0.50948	**K5=**	3.92503e+07
Jd=	78.16	**Kd=**	3.17956e+07	**J4=**	0.00	0.00000	**K4=**	0.00000e+00
Je=	0.00	**Ke=**	0.00000e+00	**J3=**	0.00	0.00000	**K3=**	0.00000e+00
Jf=	0.00	**Kf=**	0.00000e+00	**J2=**	0.00	0.00000	**K2=**	0.00000e+00
Jg=	0.00	**Kg=**	0.00000e+00	**J1=**	0.00	0.00000	**K1=**	0.00000e+00
Jh=	0.00	**Kh=**	0.00000e+00	**J0=**	0.29	0.00075	**K0=**	1.98884e+06
Ji=	0.00	**Ki=**	0.00000e+00		Oil Pump			
Jj=	0.00	**Kj=**	0.00000e+00					
Jz=	8.18	**Kz=**	2.12155e+06		**Equivalent Inertia**			**Equivalent Stiffness**



GE Oil & Gas - Start Up Torque Report

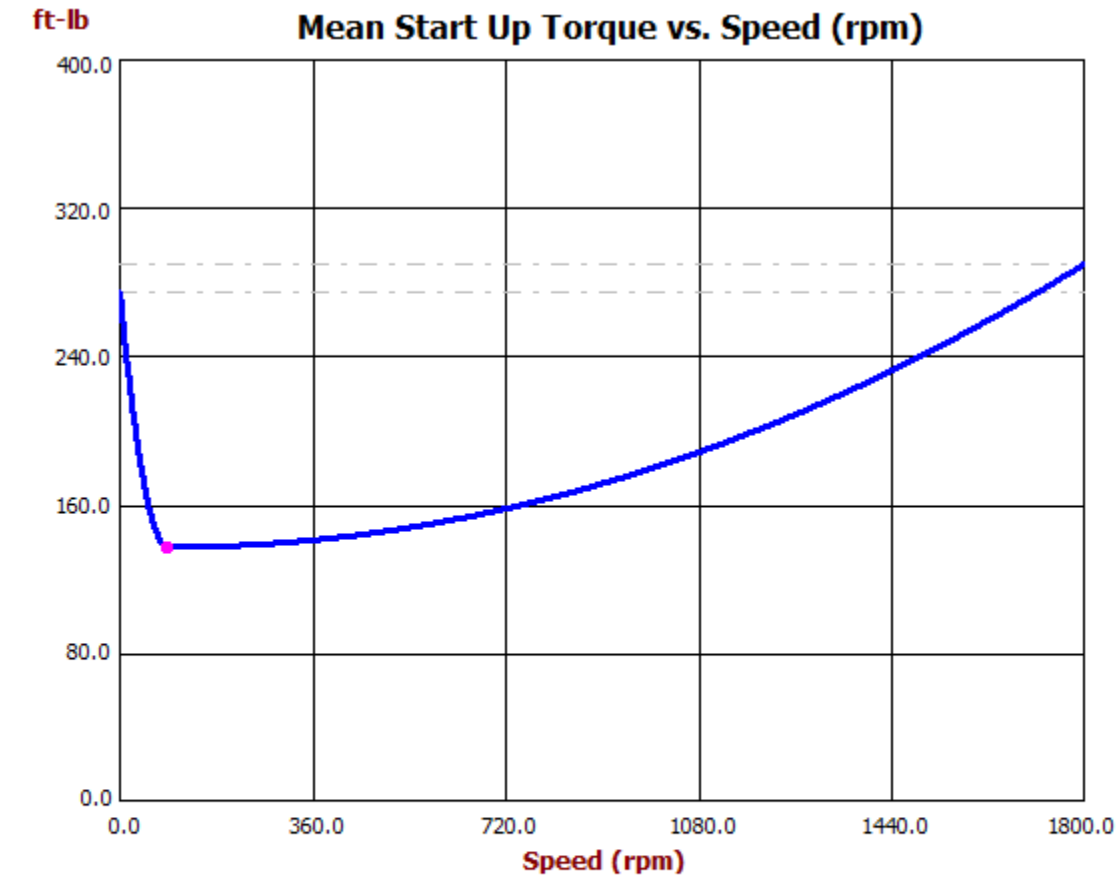
Project Name: Core Mark #2
Customer/End-user: GAIN Clean Fuel / Core Mark
Packager: CMD Corp
Site Location: Forrest City, AR

Quote #: CMD08
Case #: n/a
Version: 02.02.00
Date: 2/24/2014, 3:34:15 PM

Compressor: H302

Item	Units	Value	Notes
Rated Speed:	rpm	1800	Driver if specified, else frame.
Max Observed Compressor Torque:	ft-lb	540.431	
Recommended Minimum Motor Torque:	ft-lb	583.556	
Rated Motor Torque:	ft-lb	583.556	When specified in HSR model.
Maximum Power based on Design Points:	ft-lb	594.474	Reflects a 10% cushion adjustment.
Minimum Suction Pressure Specified:	psiG	0.000	**SERVICE #1**
Maximum Suction Pressure Specified:	psiG	1,000.000	As specified in HSR modeling file.
Minimum Suction Pressure Specified:	psiG	n/a	**SERVICE #2** *(When Present)*
Maximum Suction Pressure Specified:	psiG	n/a	As specified in HSR modeling file.

- *When Rated Motor Torque not identified, calculations based on Maximum Load indicated by user-specified design point(s).*
- *Otherwise, calculations are based on the Rated Motor Torque.*
- *No allowance is made for Inertia Torque.*
- *Model based on an overall bypass method for starting unit (i.e. gas moves across stages and then bypassed back to suction).*



Cylinder's Internal Gas Pressure: 1000.0000 psiG Used for Service #1 Cylinders.

Stage Pressure Rise: 25.0000 psiA

GE Oil & Gas - Unbalanced Couples and Forces

Project Name: Core Mark #2
Customer/End-user: GAIN Clean Fuel / Core Mark
Packager: CMD Corp
Site Location: Forrest City, AR

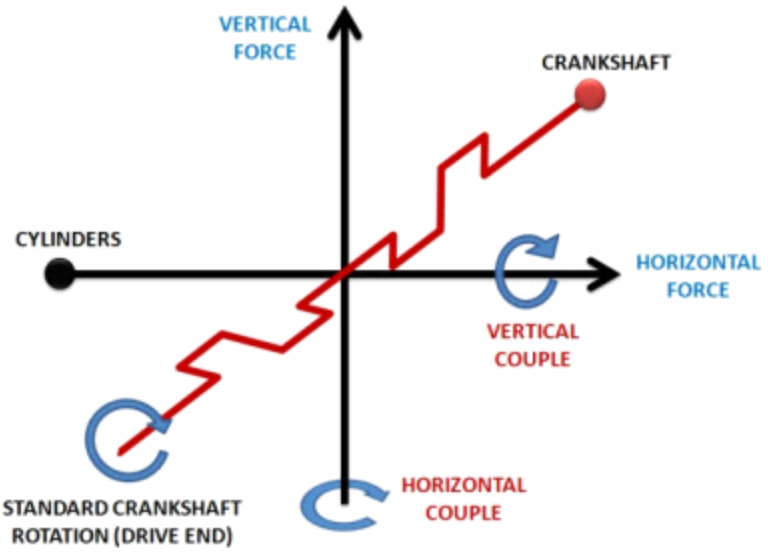
Quote #: CMD08
Case #: n/a
Version: 02.02.00
Date: 2/24/2014, 3:34:19 PM

Frame:	H302
Speed:	1785 rpm

Throw #1:	Head End [H-Series (Bore=1.5-in, MAWP=6000 psiG)], Crank End [H-Series (Bore=3-in, MAWP=2500 psiG)]
Throw #2:	Head End [H-Series (Bore=8-in, MAWP=300 psiG)], Crank End [H-Series (Bore=5-in, MAWP=1250 psiG)]
Throw #3:	N/A
Throw #4:	N/A
Throw #5:	N/A
Throw #6:	N/A

Resultant Horizontal Couples	ft-lb	N-m
Primary:	1709	2317
Secondary:	292	395

Resultant Vertical Couples	ft-lb	N-m
Primary:	56	76



GE Oil & Gas - Unbalanced Couples and Forces

Project Name: Core Mark #2
Customer/End-user: GAIN Clean Fuel / Core Mark
Packager: CMD Corp
Site Location: Forrest City, AR

Quote #: CMD08
Case #: n/a
Version: 02.02.00
Date: 2/24/2014, 3:34:20 PM

Frame:	H302
Speed:	1800 rpm

Throw #1:	Head End [H-Series (Bore=1.5-in, MAWP=6000 psiG)], Crank End [H-Series (Bore=3-in, MAWP=2500 psiG)]
Throw #2:	Head End [H-Series (Bore=8-in, MAWP=300 psiG)], Crank End [H-Series (Bore=5-in, MAWP=1250 psiG)]
Throw #3:	N/A
Throw #4:	N/A
Throw #5:	N/A
Throw #6:	N/A

Resultant Horizontal Couples	ft-lb	N-m
Primary:	1738	2356
Secondary:	297	402

Resultant Vertical Couples	ft-lb	N-m
Primary:	57	78