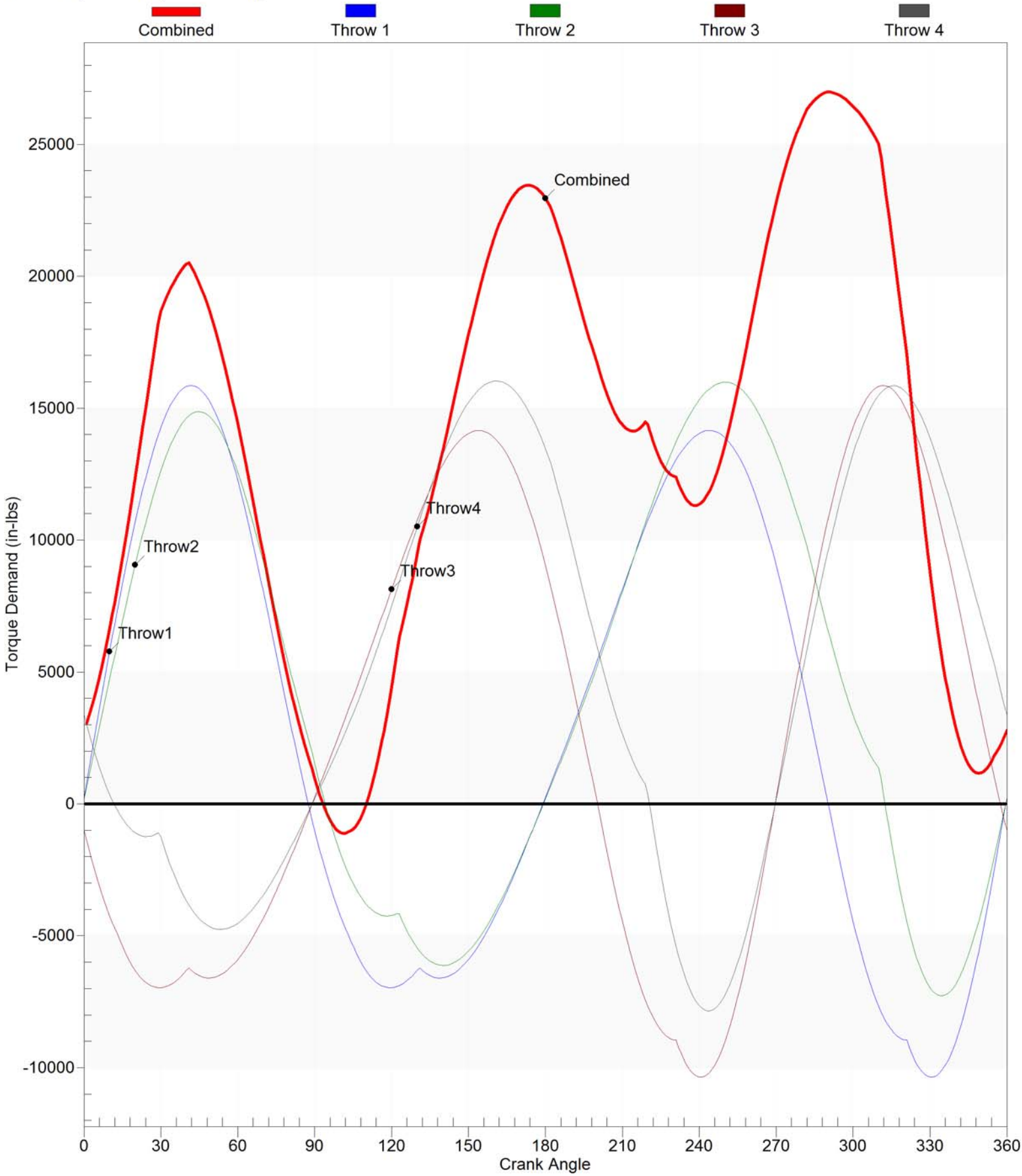
Crankshaft Torque Demand - Ariel 7.6.7.0

Gas Lift Compressors

Frame: JGJ/4, RPM: 1800.0

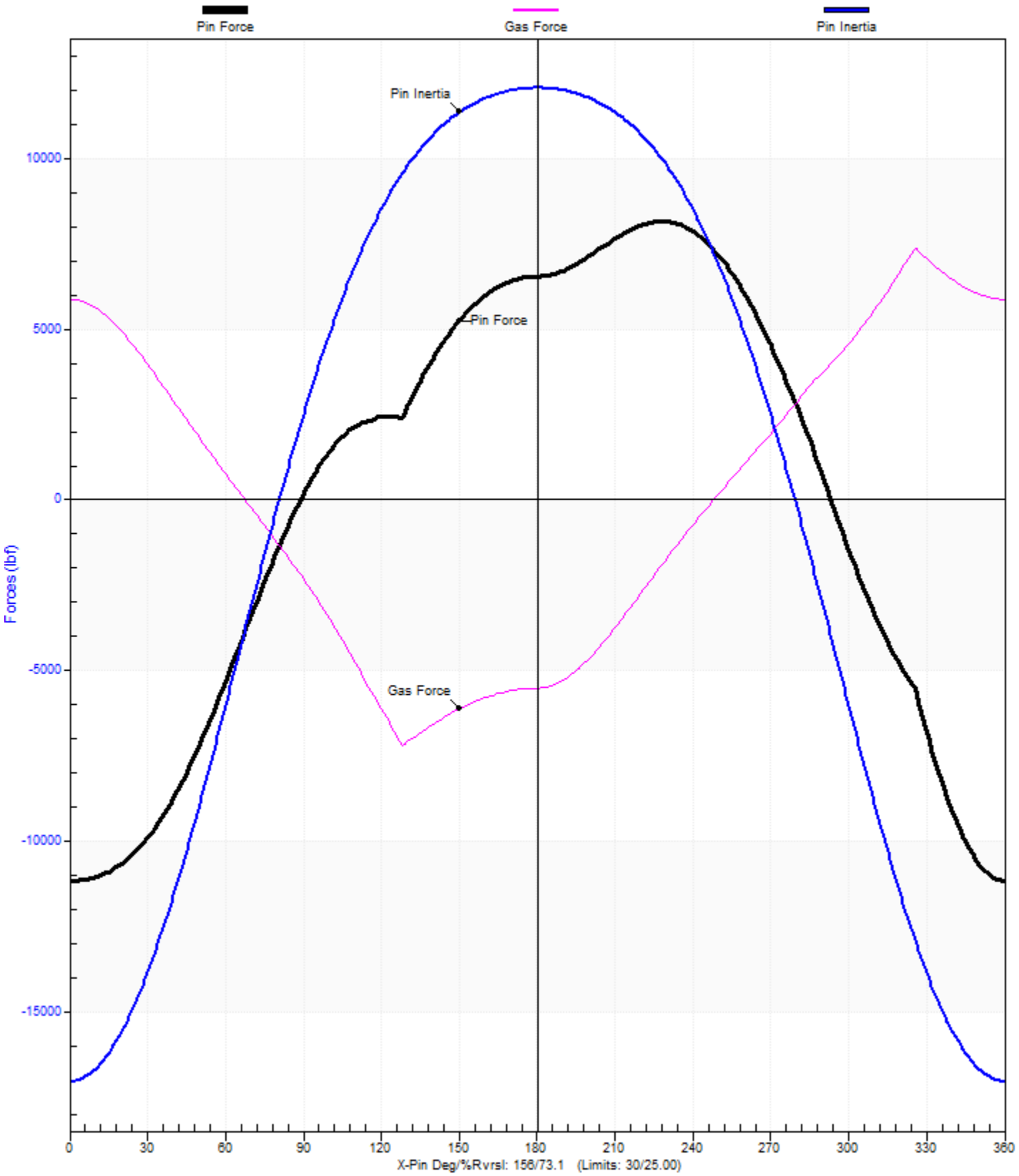
Throw 1: Cyl: 8-3/8RJ (Bore: 8.000 in)
Throw 2: Cyl: 3-7/8RJ (Bore: 3.625 in)
Throw 3: Cyl: 8-3/8RJ (Bore: 8.000 in)
Throw 4: Cyl: 6-3/8RJ (Bore: 6.000 in)



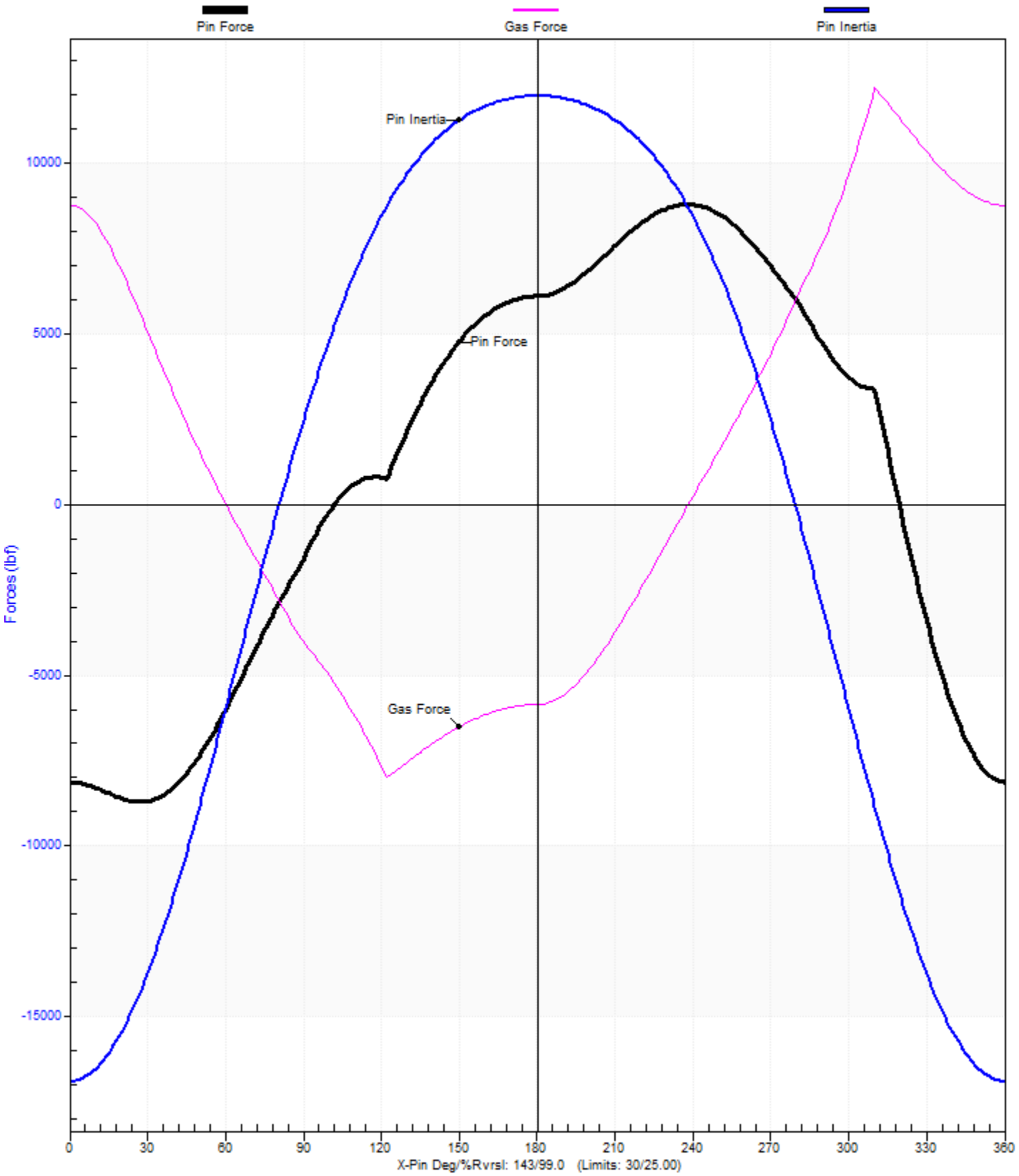
Dynamic Forces

7.6.7.0	Company:	Enerflex Energy Systems	Customer:	EOG Resources	
	Quote:	42622-42623	Inquiry:	2.0 MMSCFD	
	Case 7:	Range	Project:	Gas Lift Compressors	

Throw: 1 - Cylinder: 8-3/8RJ (Bore: 8.000 in)



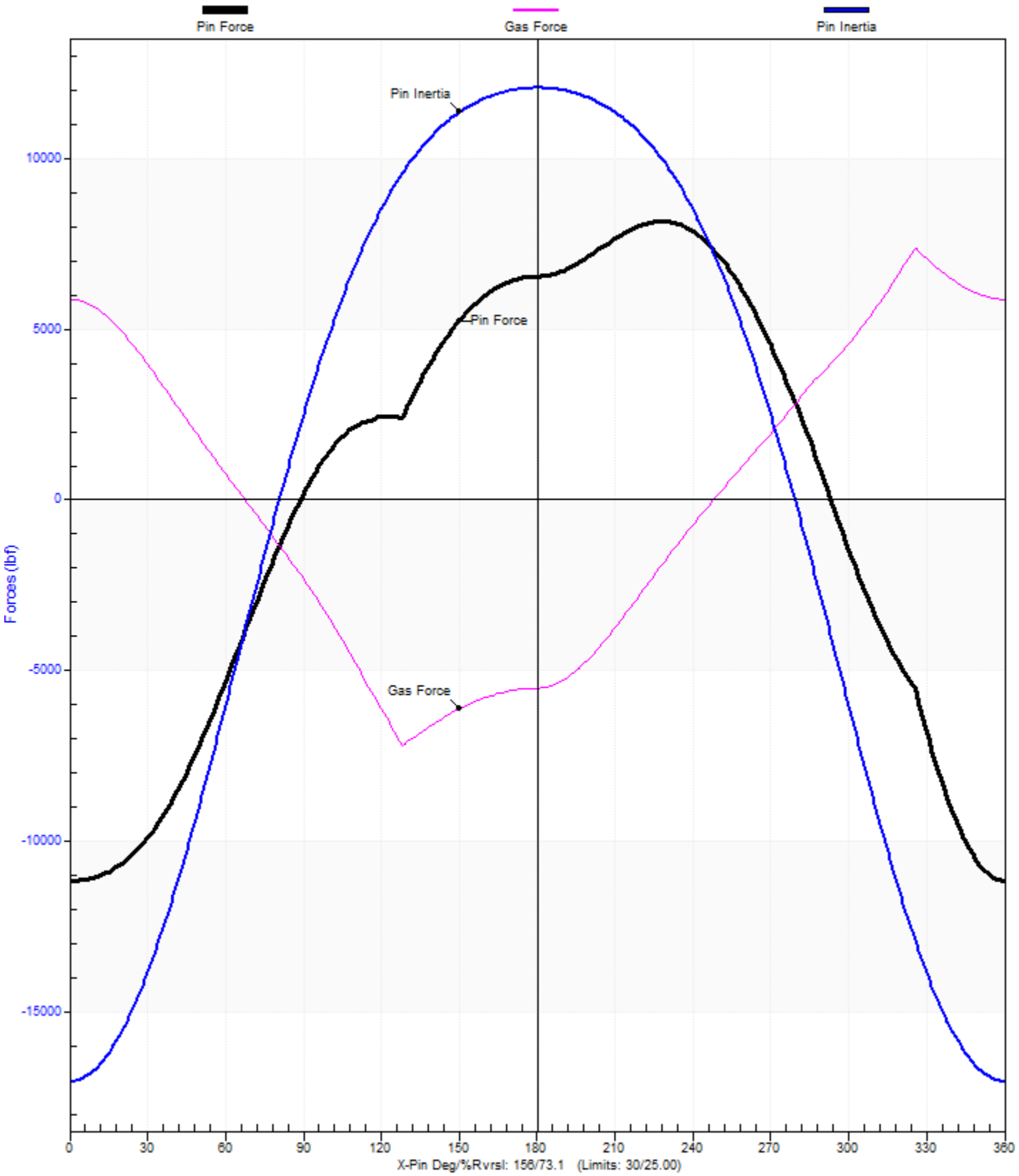
Throw: 2 - Cylinder: 3-7/8RJ (Bore: 3.625 in)



Dynamic Forces

7.6.7.0	Company:	Enerflex Energy Systems	Customer:	EOG Resources	
	Quote:	42622-42623	Inquiry:	2.0 MMSCFD	
	Case 7:	Range	Project:	Gas Lift Compressors	

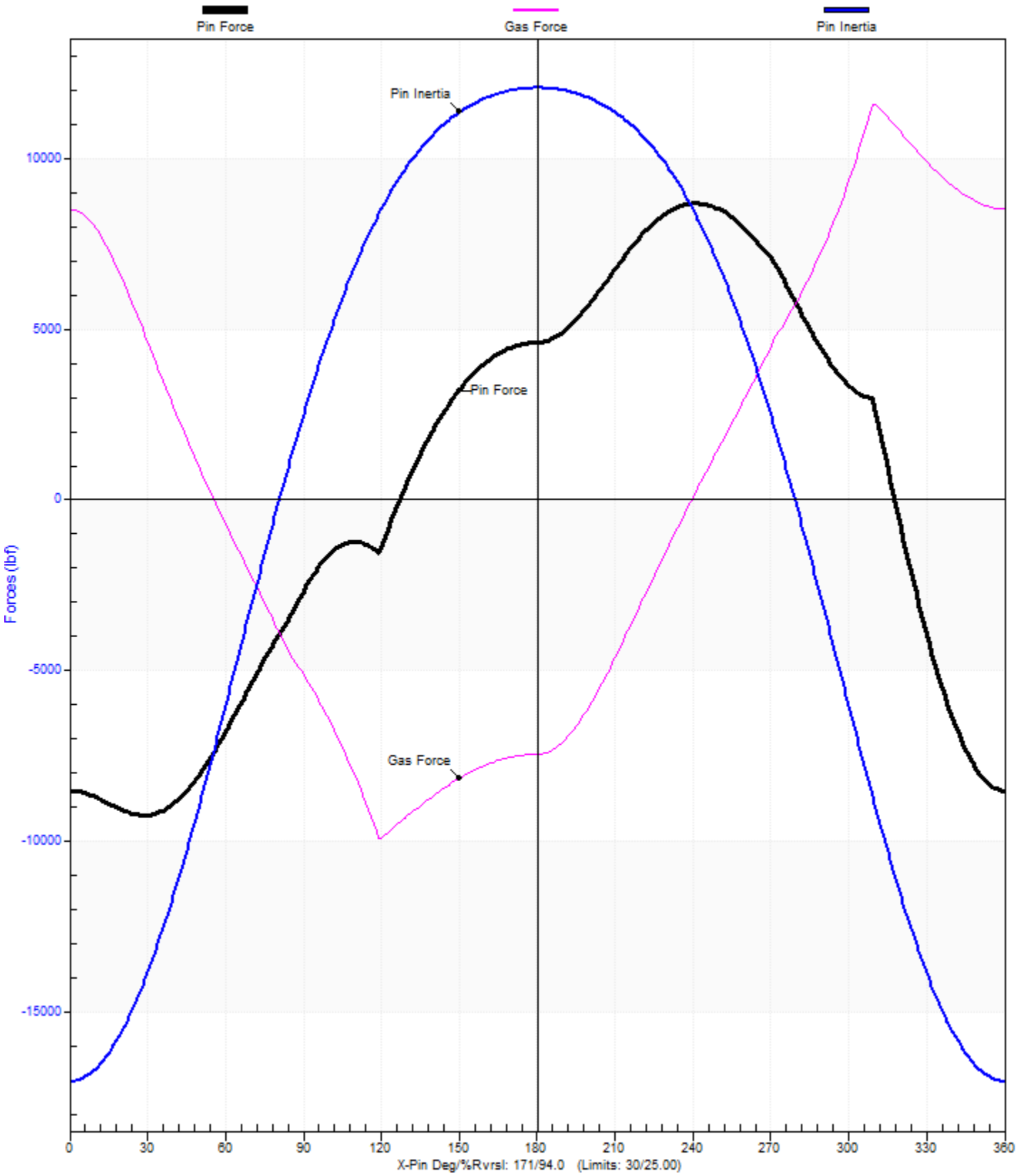
Throw: 3 - Cylinder: 8-3/8RJ (Bore: 8.000 in)



Dynamic Forces

7.6.7.0	Company:	Enerflex Energy Systems	Customer:	EOG Resources	
	Quote:	42622-42623	Inquiry:	2.0 MMSCFD	
	Case 7:	Range	Project:	Gas Lift Compressors	

Throw: 4 - Cylinder: 6-3/8RJ (Bore: 6.000 in)



Frame: JGJ/4 Stroke: 3.50 in Conrod Center Dist: 10.25 in Rotation: Clockwise

Combined

Fourier Expansion Coefficient Computation:
TORQUE(X) = A0 + Summation { AH * Cosine(HX) + BH * Sine(HX) }
Order H steps from 1 to 24 in increments of 1.
Angle X (in radians) ranges from -PI to +PI.
Note that Phase Angle is computed in degrees.
Angles are measured in the direction of rotation when looking aft from the drive stub to the aux end. Zero degrees is Piston #1 Outer Dead Center at 9 o''clock.

The average value, in-lbs	13832.3
The minimum value, in-lbs	-1116.9
The maximum value, in-lbs	26996.6
Ratio of min/avg:	-0.081
Ratio of max/avg:	1.952
Peak to Peak, in-lbs	28113.6
(Peak-Peak)/2, in-lbs	14056.8

Order -H-	AH Coeff in-lbs	BH Coeff in-lbs	Vector Sum in-lbs	Percent of A0(%)	Phase deg	Vector Sum Graph
0	13832.3	---	---	---	---	
1	-2029.8	-5569.7	5928.1	42.9	-110.0	
2	535.9	77.8	541.5	3.9	8.3	
3	-7649.4	5523.0	9434.9	68.2	144.2	
4	-2070.6	1300.5	2445.1	17.7	147.9	
5	-369.7	492.9	616.2	4.5	126.9	
6	-54.7	51.8	75.3	0.5	136.6	
7	-141.7	312.3	343.0	2.5	114.4	
8	619.3	-382.6	727.9	5.3	-31.7	
9	97.7	-224.9	245.2	1.8	-66.5	
10	0.9	-66.5	66.5	0.5	-89.2	
11	38.4	-183.2	187.2	1.4	-78.1	
12	-26.7	105.1	108.5	0.8	104.2	
13	0.4	62.9	62.9	0.5	89.7	
14	32.3	9.2	33.6	0.2	15.9	
15	26.8	43.6	51.2	0.4	58.4	
16	5.8	-46.7	47.1	0.3	-82.9	
17	-14.3	-4.6	15.0	0.1	-162.3	
18	-10.6	9.8	14.4	0.1	137.0	
19	-48.9	-2.2	48.9	0.4	-177.4	
20	23.7	10.4	25.8	0.2	23.7	
21	-1.7	-27.7	27.7	0.2	-93.4	
22	-5.7	-4.7	7.3	0.1	-140.6	
23	17.3	-51.9	54.7	0.4	-71.6	
24	-13.8	-28.5	31.6	0.2	-115.8	

Throw 1

Fourier Expansion Coefficient Computation:
TORQUE(X) = A0 + Summation { AH * Cosine(HX) + BH * Sine(HX) }
Order H steps from 1 to 24 in increments of 1.
Angle X (in radians) ranges from -PI to +PI.
Note that Phase Angle is computed in degrees.
Angles are measured in the direction of rotation when looking aft from the drive stub to the aux end. Zero degrees is current throw Outer Dead Center at 9 o"clock. Throw data is not phased to throw 1.

The average value, in-lbs	2504.1
The minimum value, in-lbs	-10359.0
The maximum value, in-lbs	15863.4
Ratio of min/avg:	-4.137
Ratio of max/avg:	6.335
Peak to Peak, in-lbs	26222.4
(Peak-Peak)/2, in-lbs	13111.2

Order -H-	AH Coeff in-lbs	BH Coeff in-lbs	Vector Sum in-lbs	Percent of A0(%)	Phase deg	Vector Sum Graph
0	2504.1	---	---	---	---	
1	293.9	-1430.0	1459.8	58.3	-78.4	
2	-2018.6	10924.7	11109.6	443.7	100.5	
3	-168.8	3457.4	3461.5	138.2	92.8	
4	-490.5	151.6	513.4	20.5	162.8	
5	-177.2	-102.6	204.7	8.2	-149.9	
6	94.1	190.1	212.1	8.5	63.7	
7	-37.6	97.5	104.5	4.2	111.1	
8	146.4	24.0	148.3	5.9	9.3	
9	75.3	59.8	96.2	3.8	38.4	
10	37.4	-72.2	81.3	3.2	-62.6	
11	58.5	-53.1	79.0	3.2	-42.2	
12	-37.9	-12.9	40.0	1.6	-161.2	
13	-41.9	-43.2	60.1	2.4	-134.1	
14	-1.5	20.5	20.5	0.8	94.1	
15	-30.0	32.4	44.1	1.8	132.9	
16	6.1	1.8	6.3	0.3	16.9	
17	20.9	23.0	31.1	1.2	47.8	
18	3.6	3.9	5.3	0.2	47.5	
19	20.6	-11.1	23.4	0.9	-28.3	
20	7.5	-2.9	8.1	0.3	-21.1	
21	-6.3	-19.8	20.8	0.8	-107.6	
22	-1.1	-7.8	7.9	0.3	-97.9	
23	-18.1	5.8	19.0	0.8	162.3	
24	-8.2	-0.6	8.3	0.3	-175.5	

Throw 2

Fourier Expansion Coefficient Computation:
TORQUE(X) = A0 + Summation { AH * Cosine(HX) + BH * Sine(HX) }
Order H steps from 1 to 24 in increments of 1.
Angle X (in radians) ranges from -PI to +PI.
Note that Phase Angle is computed in degrees.
Angles are measured in the direction of rotation when looking aft from the drive stub to the aux end. Zero degrees is current throw Outer Dead Center at 9 o"clock. Throw data is not phased to throw 1.

The average value, in-lbs	4191.6
The minimum value, in-lbs	-7274.8
The maximum value, in-lbs	15986.7
Ratio of min/avg:	-1.736
Ratio of max/avg:	3.814
Peak to Peak, in-lbs	23261.4
(Peak-Peak)/2, in-lbs	11630.7

Order -H-	AH Coeff in-lbs	BH Coeff in-lbs	Vector Sum in-lbs	Percent of A0(%)	Phase deg	Vector Sum Graph
0	4191.6	---	---	---	---	
1	964.8	-3119.6	3265.4	77.9	-72.8	
2	-3923.3	8892.1	9719.1	231.9	113.8	
3	-986.9	2900.7	3064.0	73.1	108.8	
4	-584.0	492.5	764.0	18.2	139.9	
5	-176.3	157.3	236.3	5.6	138.3	
6	386.4	232.9	451.1	10.8	31.1	
7	151.4	91.2	176.7	4.2	31.1	
8	188.9	-192.8	269.9	6.4	-45.6	
9	110.8	-91.7	143.8	3.4	-39.6	
10	-116.6	-49.9	126.8	3.0	-156.8	
11	-96.3	-58.4	112.6	2.7	-148.7	
12	3.8	81.3	81.4	1.9	87.4	
13	-4.3	91.0	91.1	2.2	92.7	
14	53.1	-4.0	53.3	1.3	-4.3	
15	60.3	-15.9	62.3	1.5	-14.7	
16	-5.7	-35.4	35.8	0.9	-99.2	
17	-13.4	-39.0	41.2	1.0	-108.9	
18	-20.3	12.9	24.1	0.6	147.6	
19	-34.7	15.0	37.8	0.9	156.6	
20	9.5	8.5	12.7	0.3	41.7	
21	24.1	29.1	37.8	0.9	50.3	
22	7.0	0.2	7.0	0.2	1.3	
23	16.2	-27.9	32.2	0.8	-59.8	
24	1.6	-11.2	11.3	0.3	-81.9	

Throw 3

Fourier Expansion Coefficient Computation:
TORQUE(X) = A0 + Summation { AH * Cosine(HX) + BH * Sine(HX) }
Order H steps from 1 to 24 in increments of 1.
Angle X (in radians) ranges from -PI to +PI.
Note that Phase Angle is computed in degrees.
Angles are measured in the direction of rotation when looking aft from the drive stub to the aux end. Zero degrees is current throw Outer Dead Center at 9 o"clock. Throw data is not phased to throw 1.

The average value, in-lbs	2504.1
The minimum value, in-lbs	-10359.0
The maximum value, in-lbs	15863.4
Ratio of min/avg:	-4.137
Ratio of max/avg:	6.335
Peak to Peak, in-lbs	26222.4
(Peak-Peak)/2, in-lbs	13111.2

Order -H-	AH Coeff in-lbs	BH Coeff in-lbs	Vector Sum in-lbs	Percent of A0(%)	Phase deg	Vector Sum Graph
0	2504.1	---	---	---	---	
1	293.9	-1430.0	1459.8	58.3	-78.4	
2	-2018.6	10924.7	11109.6	443.7	100.5	
3	-168.8	3457.4	3461.5	138.2	92.8	
4	-490.5	151.6	513.4	20.5	162.8	
5	-177.2	-102.6	204.7	8.2	-149.9	
6	94.1	190.1	212.1	8.5	63.7	
7	-37.6	97.5	104.5	4.2	111.1	
8	146.4	24.0	148.3	5.9	9.3	
9	75.3	59.8	96.2	3.8	38.4	
10	37.4	-72.2	81.3	3.2	-62.6	
11	58.5	-53.1	79.0	3.2	-42.2	
12	-37.9	-12.9	40.0	1.6	-161.2	
13	-41.9	-43.2	60.1	2.4	-134.1	
14	-1.5	20.5	20.5	0.8	94.1	
15	-30.0	32.4	44.1	1.8	132.9	
16	6.1	1.8	6.3	0.3	16.9	
17	20.9	23.0	31.1	1.2	47.8	
18	3.6	3.9	5.3	0.2	47.5	
19	20.6	-11.1	23.4	0.9	-28.3	
20	7.5	-2.9	8.1	0.3	-21.1	
21	-6.3	-19.8	20.8	0.8	-107.6	
22	-1.1	-7.8	7.9	0.3	-97.9	
23	-18.1	5.8	19.0	0.8	162.3	
24	-8.2	-0.6	8.3	0.3	-175.5	

Throw 4

Fourier Expansion Coefficient Computation:
TORQUE(X) = A0 + Summation { AH * Cosine(HX) + BH * Sine(HX) }
Order H steps from 1 to 24 in increments of 1.
Angle X (in radians) ranges from -PI to +PI.
Note that Phase Angle is computed in degrees.
Angles are measured in the direction of rotation when looking aft from the drive stub to the aux end. Zero degrees is current throw Outer Dead Center at 9 o"clock. Throw data is not phased to throw 1.

The average value, in-lbs	4632.4
The minimum value, in-lbs	-7844.8
The maximum value, in-lbs	16030.5
Ratio of min/avg:	-1.693
Ratio of max/avg:	3.461
Peak to Peak, in-lbs	23875.3
(Peak-Peak)/2, in-lbs	11937.6

Order -H-	AH Coeff in-lbs	BH Coeff in-lbs	Vector Sum in-lbs	Percent of A0(%)	Phase deg	Vector Sum Graph
0	4632.4	---	---	---	---	
1	726.3	-1858.6	1995.4	43.1	-68.7	
2	-4459.2	8814.3	9878.1	213.2	116.8	
3	-666.3	3036.3	3108.5	67.1	102.4	
4	-505.6	504.7	714.4	15.4	135.0	
5	-261.0	86.3	274.9	5.9	161.7	
6	441.1	181.1	476.8	10.3	22.3	
7	161.2	158.0	225.8	4.9	44.4	
8	137.6	-237.7	274.7	5.9	-59.9	
9	117.6	-148.2	189.2	4.1	-51.6	
10	-117.5	16.6	118.7	2.6	172.0	
11	-130.1	-23.1	132.2	2.9	-169.9	
12	45.3	49.6	67.2	1.5	47.6	
13	26.8	89.7	93.6	2.0	73.4	
14	20.9	-13.3	24.7	0.5	-32.4	
15	57.1	-28.9	64.0	1.4	-26.9	
16	-0.6	-15.1	15.1	0.3	-92.1	
17	-32.3	-44.8	55.3	1.2	-125.8	
18	-9.8	3.1	10.2	0.2	162.6	
19	-26.7	45.8	53.0	1.1	120.3	
20	-0.9	7.7	7.8	0.2	96.4	
21	43.2	0.4	43.2	0.9	0.5	
22	12.6	4.8	13.5	0.3	20.9	
23	-11.7	-24.9	27.6	0.6	-115.2	
24	1.1	-16.0	16.0	0.3	-85.9	

Mass Elastic Data

7.6.7.0	Company:	Enerflex Energy Systems	Customer:	EOG Resources
	Quote:	42622-42623	Inquiry:	2.0 MMSCFD
	Case 1:	Design Pt	Project:	Gas Lift Compressors

Frame: JGJ/4 Stroke: 3.50 in Conrod Center Dist: 10.25 in Rotation: Clockwise

Throw #:	1	2	3	4
Cylinder Model:	8-3/8RJ	3-7/8RJ	8-3/8RJ	6-3/8RJ
Cylinder Bore,in	8.000	3.625	8.000	6.000
WEIGHTS, lbs:				
Conrod Large End:	27.97	27.97	27.97	27.97
Conrod Small End:	11.53	11.53	11.53	11.53
Piston & Rod Assembly:	55.10	21.34	55.10	49.10
X-Head:	32.90	54.00	32.90	32.90
X-Head Pin Assembly:	12.90	12.90	12.90	12.90
Balance Nut:	2.40	14.30	2.40	8.40
Recip Weight,lbs	114.83	114.07	114.83	114.83
THROW INERTIA:				
Crankpin,lb·in2:	272.590	272.590	272.590	272.590
Conrod Large End,lb·in2:	85.646	85.646	85.646	85.646
Recip Weight,lb·in2:	177.121	175.949	177.121	177.121
Total, lb·in2:	535.357	534.185	535.357	535.357

MASS ELASTIC DATA

Location	Station (in)	Symbol	Inertia (lb·in2)	Internal Flywheel (lb·in2)	Symbol	Stiffness (in-lbs/RAD x 10E6)
Shoulder Stop	0.000	I1	135.320		K1	48.120
Main #1 CL	7.000	I2	196.080		K2	75.080
Throw #1 CL	11.813	I3	535.357		K3	70.900
Throw #2 CL	17.188	I4	534.185		K4	75.080
Main #2 CL	22.000	I5	174.620		K5	67.430
Spreader CL	30.750	I6	138.500		K6	67.430
Main #3 CL	39.500	I7	174.620		K7	75.080
Throw #3 CL	44.313	I8	535.357		K8	70.900
Throw #4 CL	49.688	I9	535.357		K9	75.080
Main #4 CL	54.500	I10	196.080		K10	29.010
Aux Drive End	60.000	I11	79.500			
		Total:	3234.975	0.000		

Crankshaft Material:

Material: ASTM A668 Class DH/AISI 1045 (Forged Carbon Steel)
Yield, psi: 45000
Tensile, psi: 90000

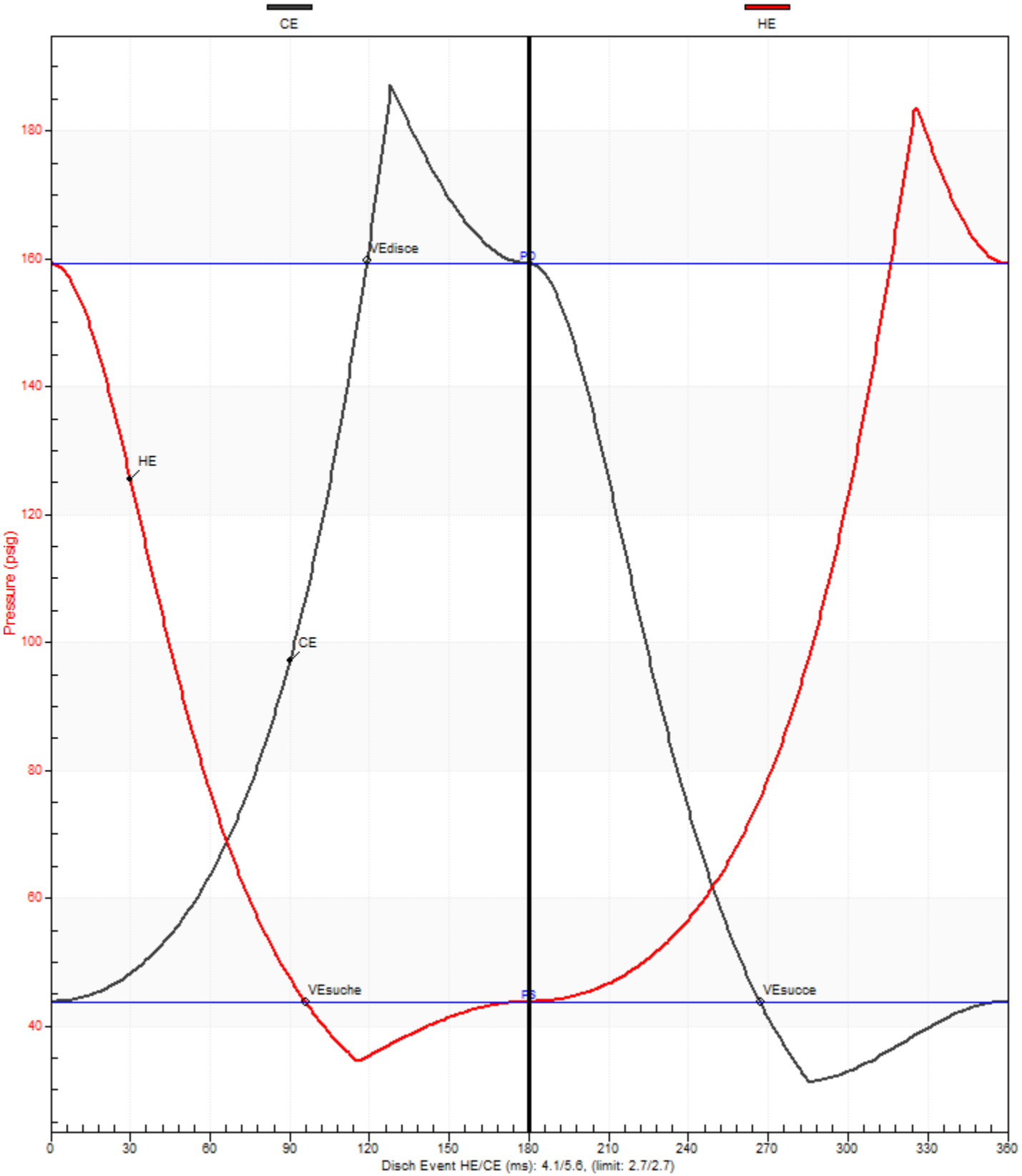
NOTES:

1. Inertia and Stiffness of the drive stub forward of the stop shoulder are not included in this table.
2. Throw Inertias include inertia for the crankshaft, as well as the connecting rod, crosshead, balance nut and piston and rod assembly for that throw.
3. Drive stub stiffness must be calculated appropriately depending upon coupling or flanged hub connection.
4. Mass elastic data listed does not include the added inertia from any optional flywheels or detuners.
5. Refer to the Ariel Packager Standards, section 5 (ER-56.05), for additional information regarding the compressor drive system and the torsional analysis requirements.
6. Inertia is for bare compressor only. If an internal auxilliary end flywheel is selected it will show above. Does not include driver, coupling, external flywheel, or internal detuners (donuts).
7. For inertia units of lb·in·sec2, divide the value of lb·in2 by 386.1 in/sec2.

PT Card

7.6.7.0	Company:	Enerflex Energy Systems	Customer:	EOG Resources	
	Quote:	42622-42623	Inquiry:	2.0 MMSCFD	
	Case 7:	Range	Project:	Gas Lift Compressors	

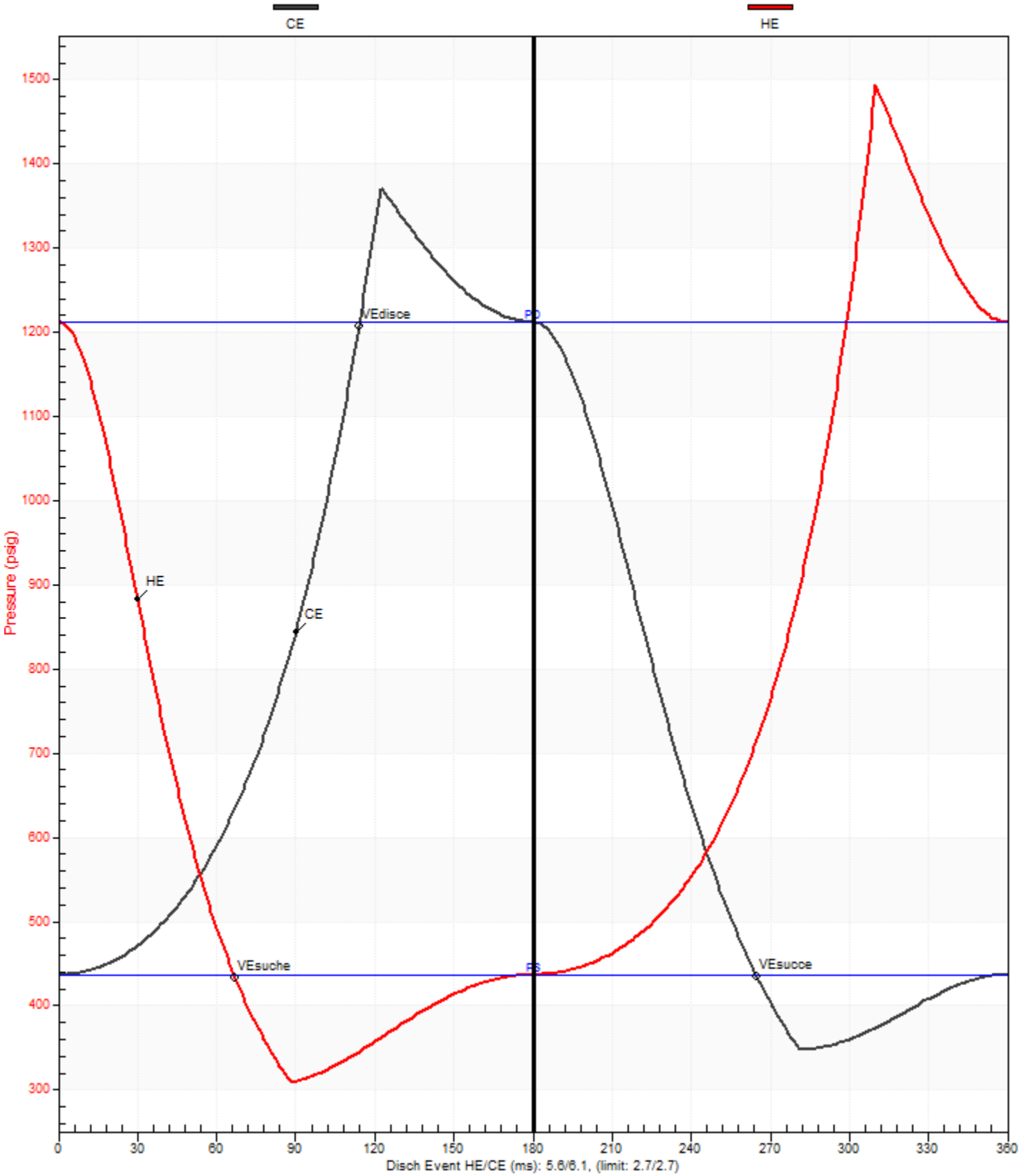
Throw: 1 - Cylinder: 8-3/8RJ (Bore: 8.000 in)



PT Card

7.6.7.0	Company:	Enerflex Energy Systems	Customer:	EOG Resources	
	Quote:	42622-42623	Inquiry:	2.0 MMSCFD	
	Case 7:	Range	Project:	Gas Lift Compressors	

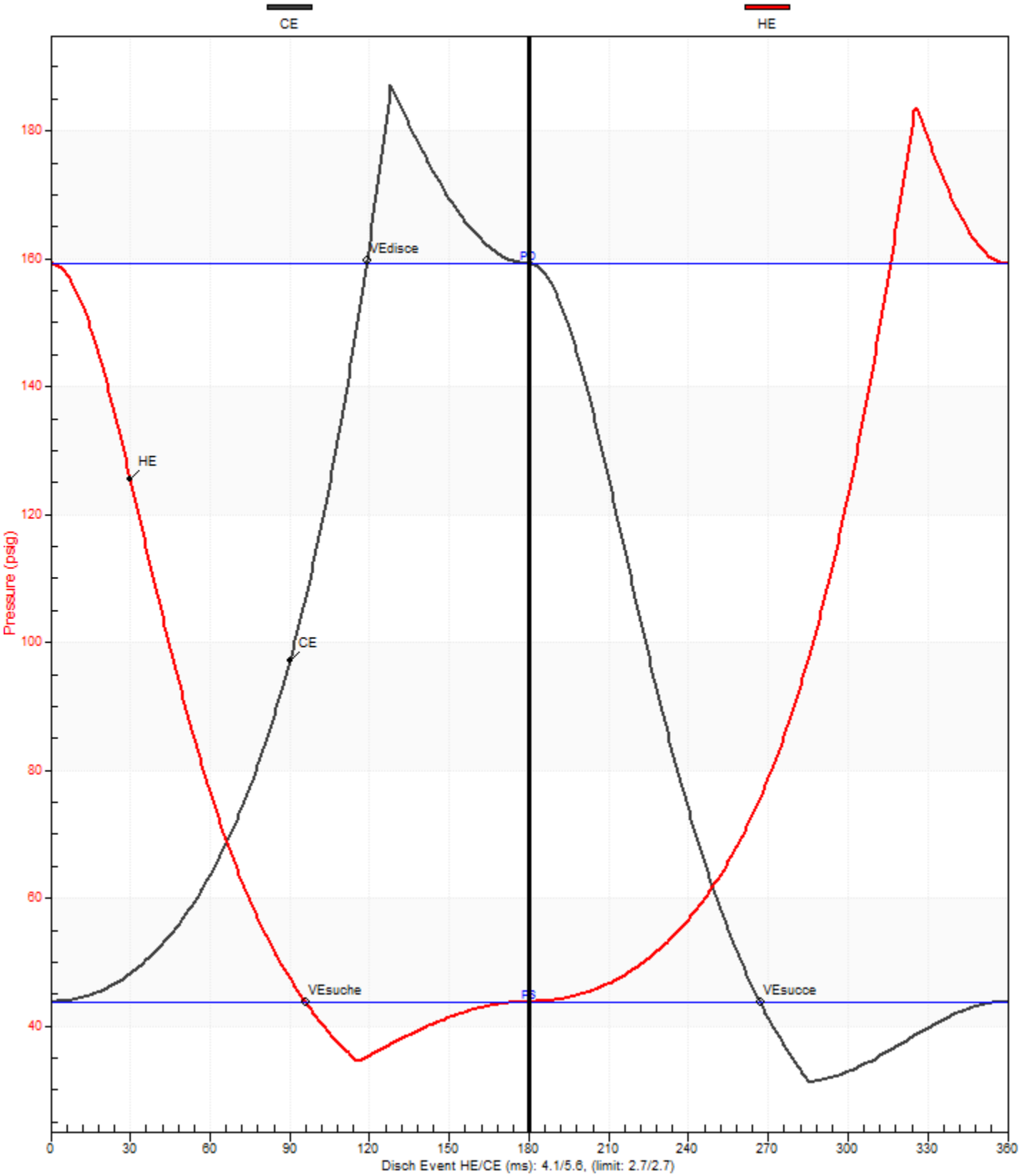
Throw: 2 - Cylinder: 3-7/8RJ (Bore: 3.625 in)



PT Card

7.6.7.0	Company:	Enerflex Energy Systems	Customer:	EOG Resources	
	Quote:	42622-42623	Inquiry:	2.0 MMSCFD	
	Case 7:	Range	Project:	Gas Lift Compressors	

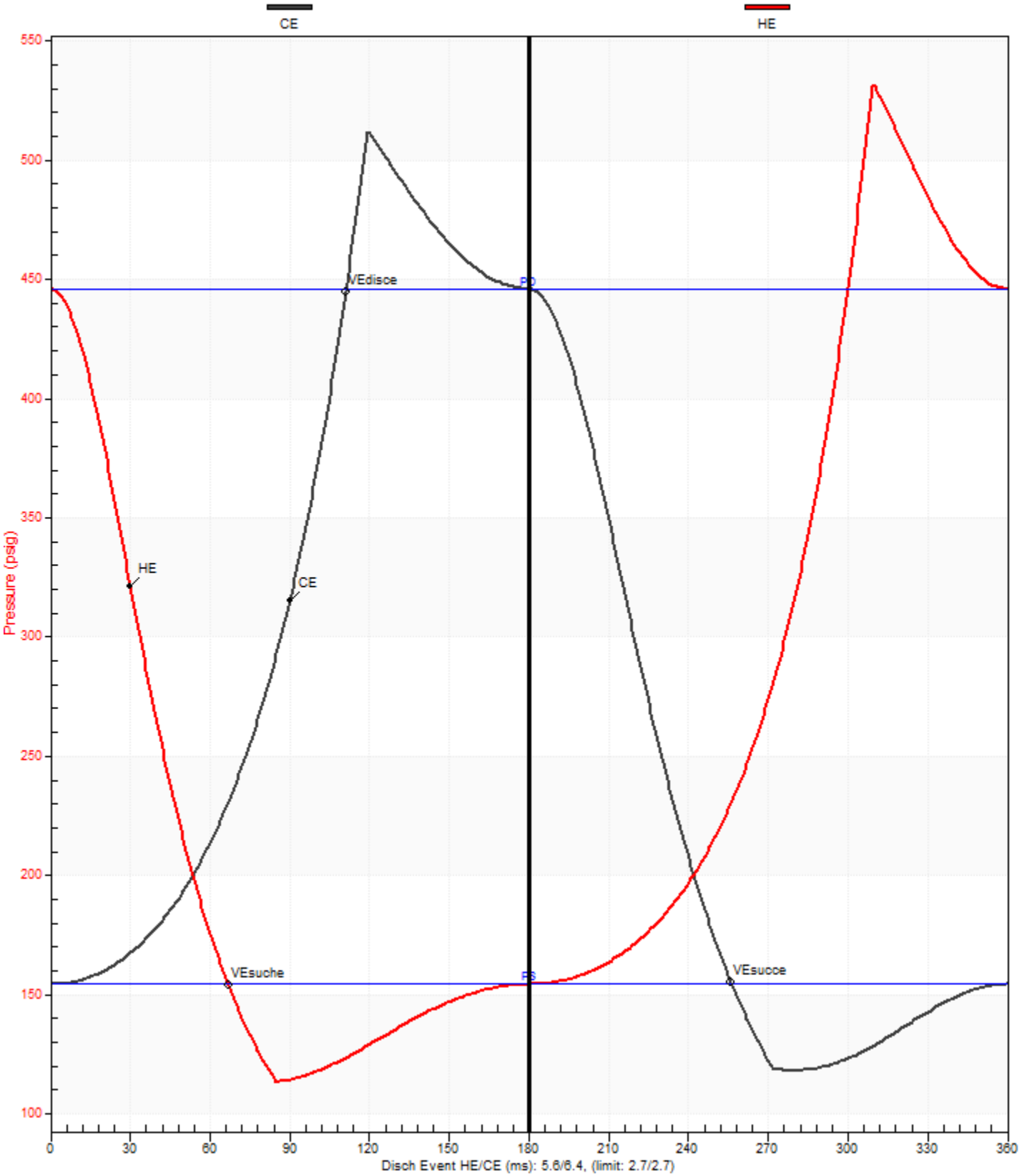
Throw: 3 - Cylinder: 8-3/8RJ (Bore: 8.000 in)



PT Card

7.6.7.0	Company:	Enerflex Energy Systems	Customer:	EOG Resources	
	Quote:	42622-42623	Inquiry:	2.0 MMSCFD	
	Case 7:	Range	Project:	Gas Lift Compressors	

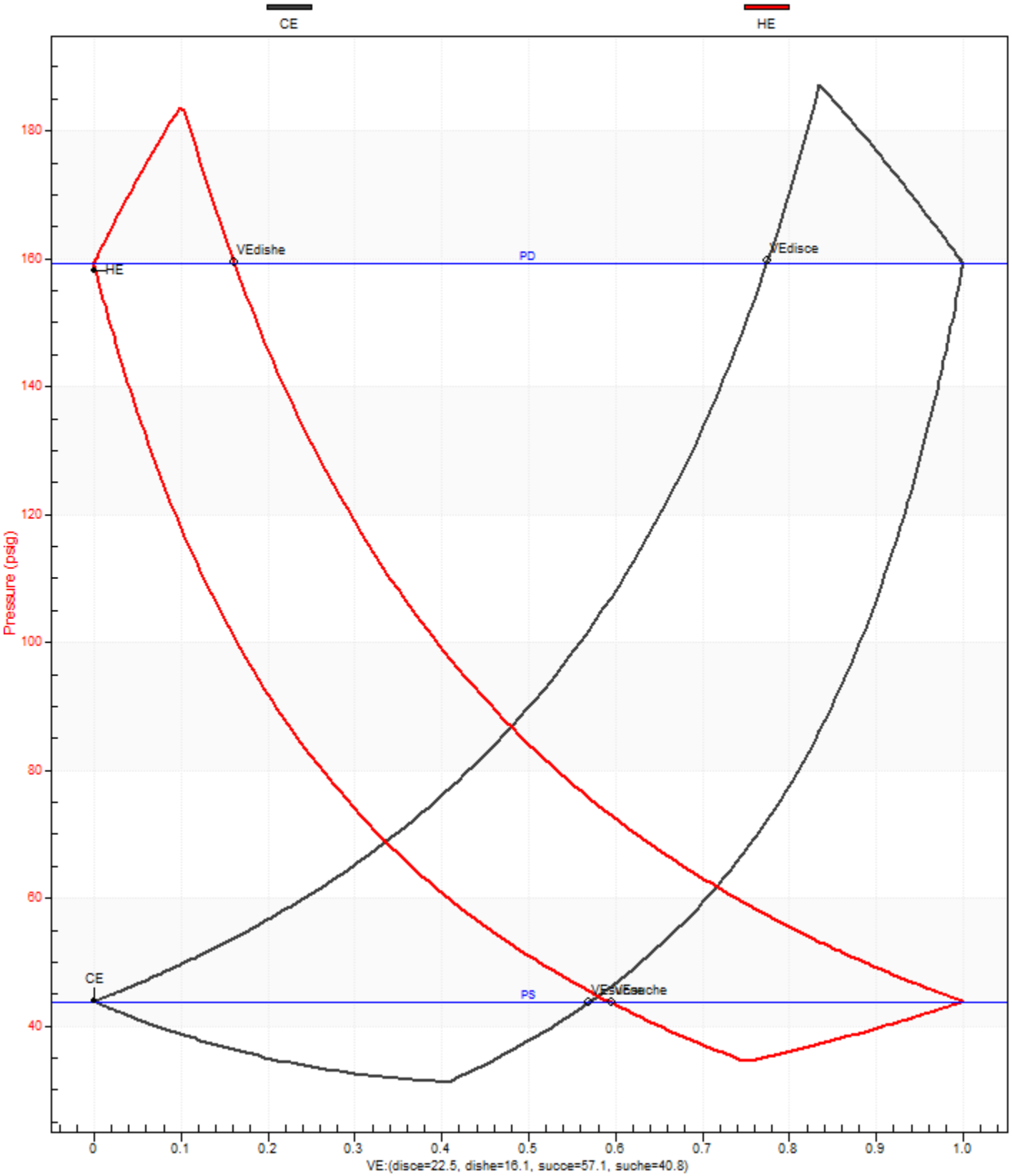
Throw: 4 - Cylinder: 6-3/8RJ (Bore: 6.000 in)



PV Card

7.6.7.0	Company:	Enerflex Energy Systems	Customer:	EOG Resources
	Quote:	42622-42623	Inquiry:	2.0 MMSCFD
	Case 7:	Range	Project:	Gas Lift Compressors

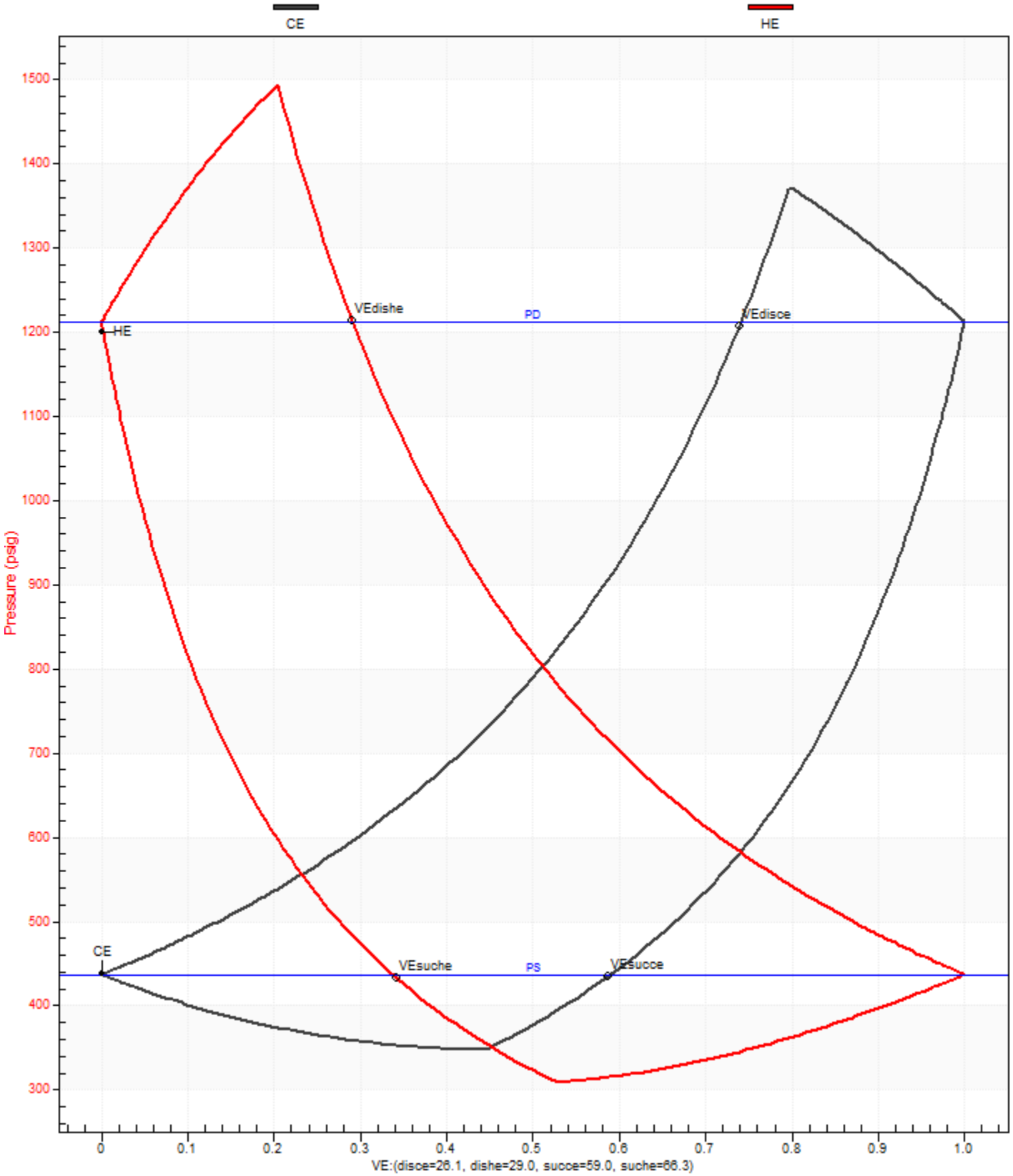
Throw: 1 - Cylinder: 8-3/8RJ (Bore: 8.000 in)



PV Card

7.6.7.0	Company:	Enerflex Energy Systems	Customer:	EOG Resources
	Quote:	42622-42623	Inquiry:	2.0 MMSCFD
	Case 7:	Range	Project:	Gas Lift Compressors

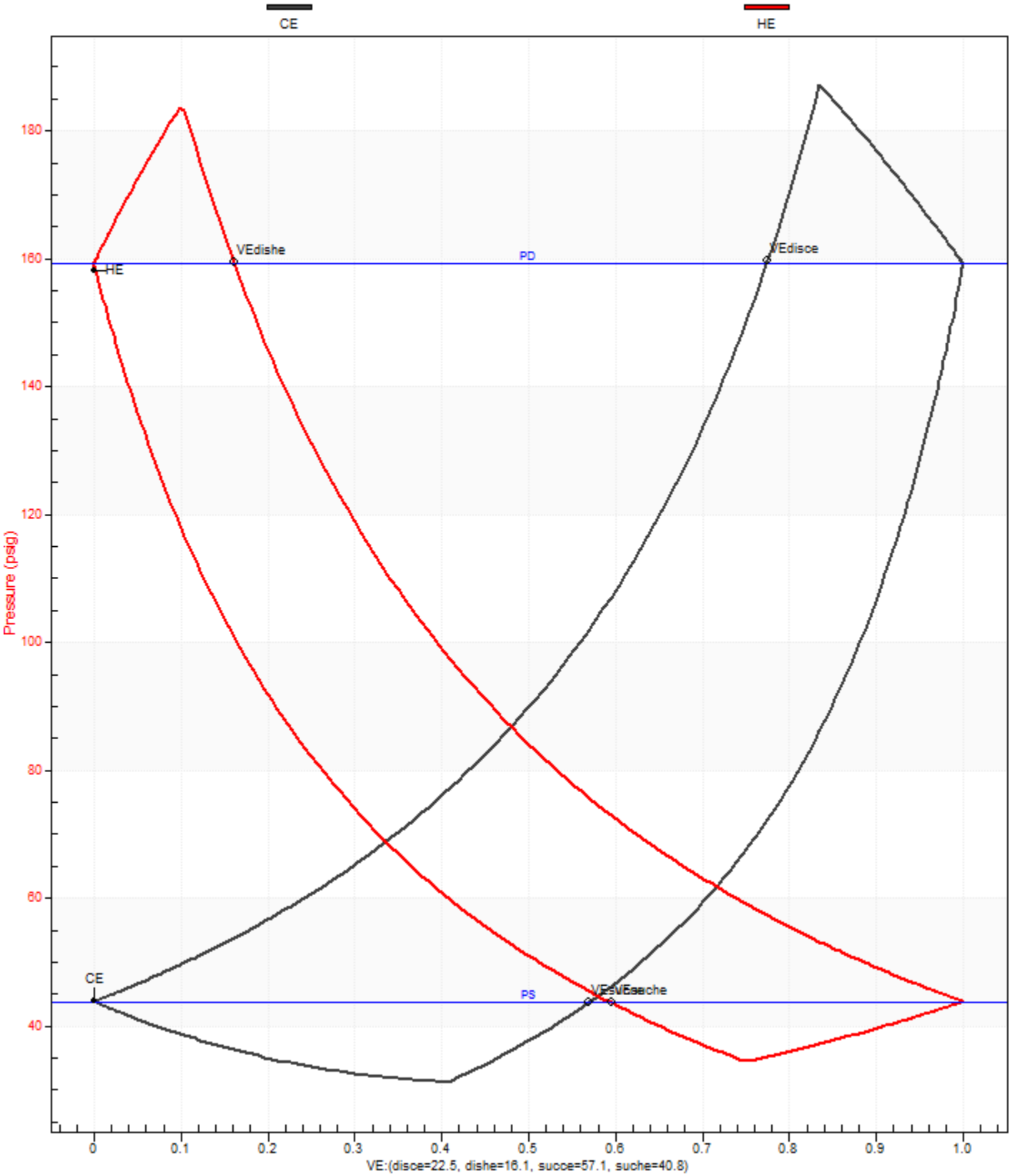
Throw: 2 - Cylinder: 3-7/8RJ (Bore: 3.625 in)



PV Card

7.6.7.0	Company:	Enerflex Energy Systems	Customer:	EOG Resources
	Quote:	42622-42623	Inquiry:	2.0 MMSCFD
	Case 7:	Range	Project:	Gas Lift Compressors

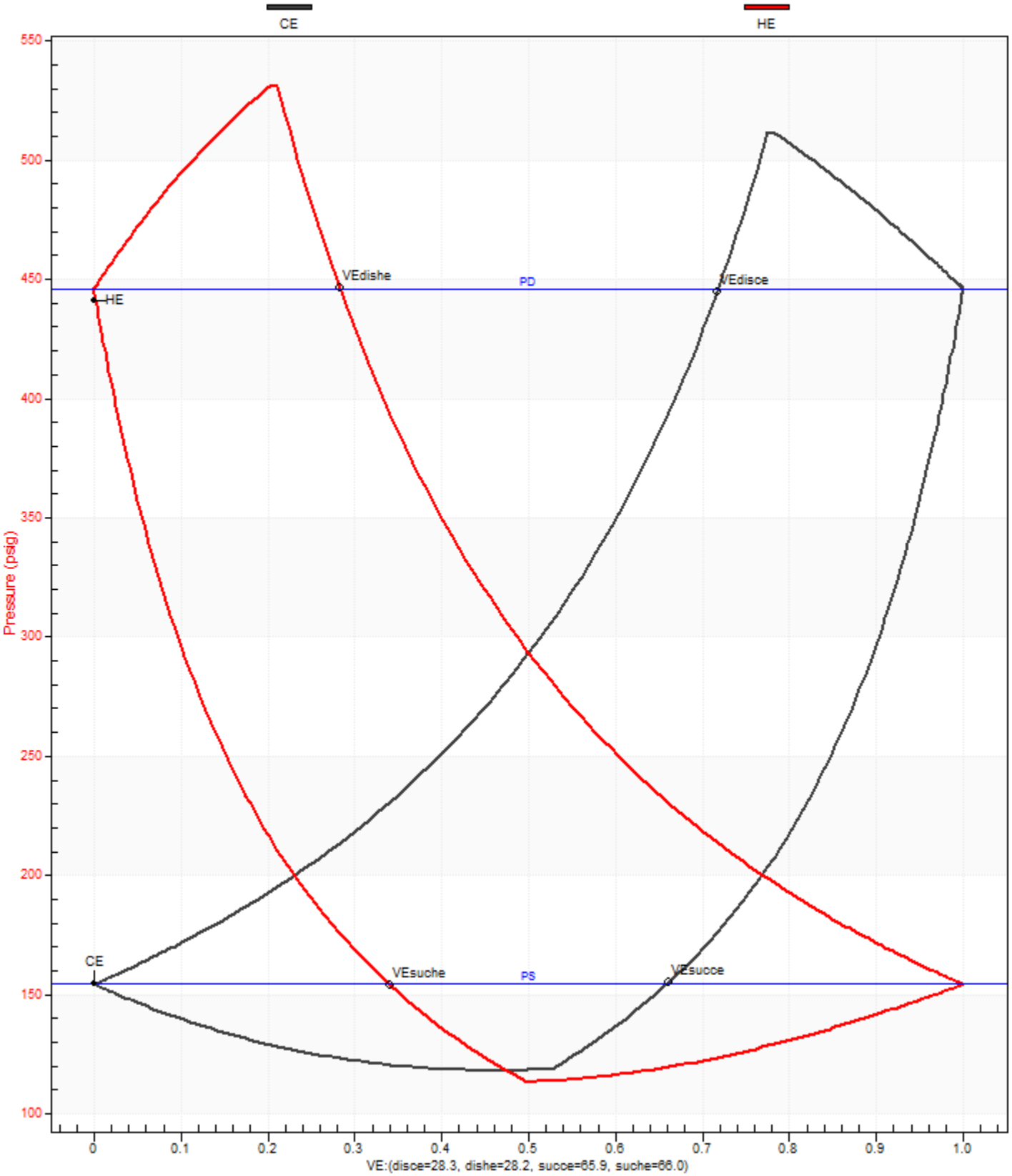
Throw: 3 - Cylinder: 8-3/8RJ (Bore: 8.000 in)



PV Card

7.6.7.0	Company:	Enerflex Energy Systems	Customer:	EOG Resources	
	Quote:	42622-42623	Inquiry:	2.0 MMSCFD	
	Case 7:	Range	Project:	Gas Lift Compressors	

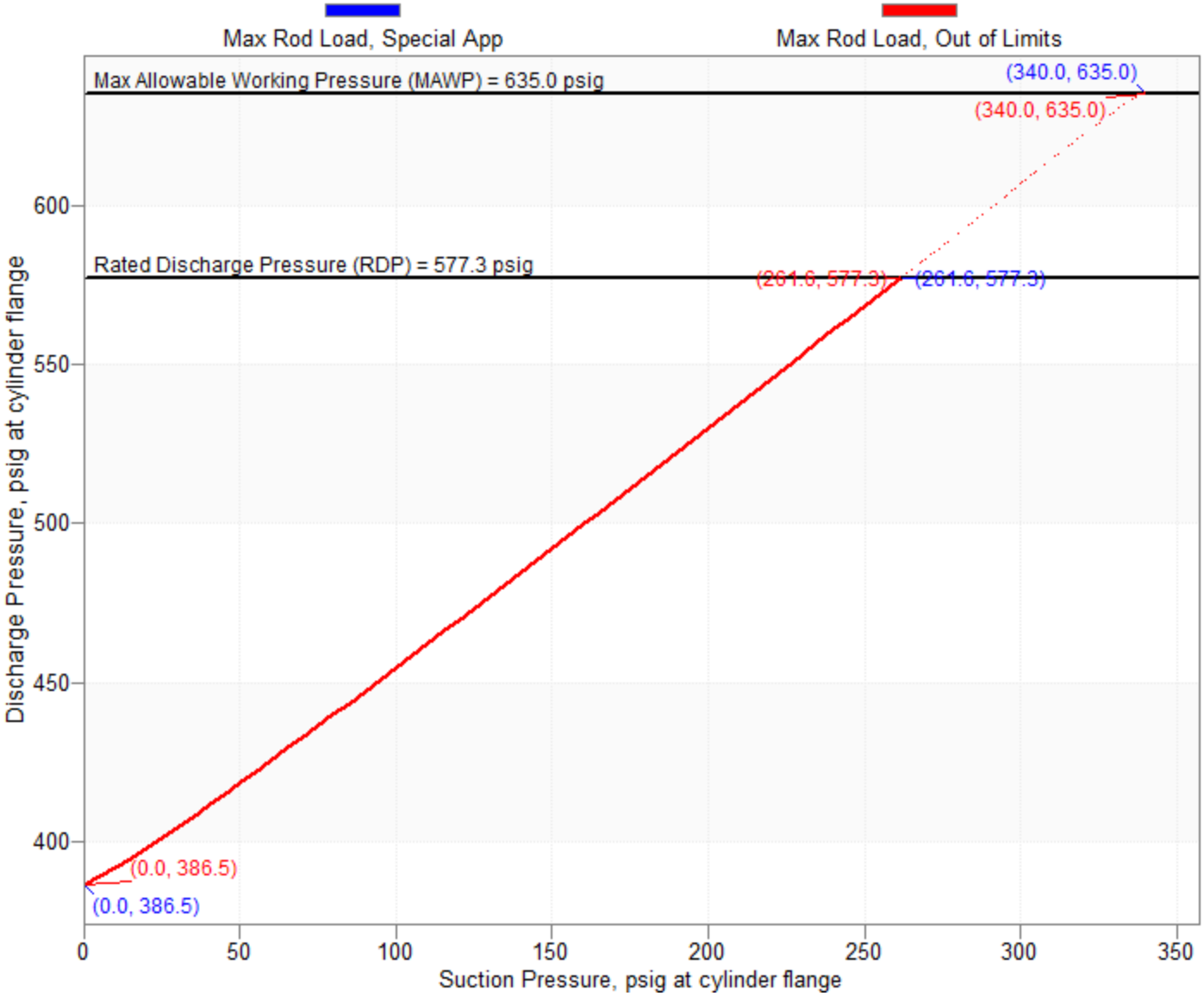
Throw: 4 - Cylinder: 6-3/8RJ (Bore: 6.000 in)



Estimated Cylinder Gas Rod Load and Pressure Limits

Model: 8-3/8RJ **Bore: 8.000 in** **MAWP: 635.0 psig**

			Special App	Out of Limits		
Frame	JGJ/4	Max RL Comp, lbf	23000	23000	Frame Serial No.	
Stroke, in	3.50	Max RL Tens, lbf	21000	21000	Cyl Serial No.	
Operating RPM	1800.0	Max RL Tot, lbf	42000	42000	Specific Gravity	1.0124
Action	DBL					



Dashed Line - Pressures above RDP. Please refer to the Application Manual.

These application limits must also be checked:

- Maximum allowable discharge temperature (MUST be less than 350 °F)
- Minimum allowable volumetric efficiency
- Crosshead pin load reversals

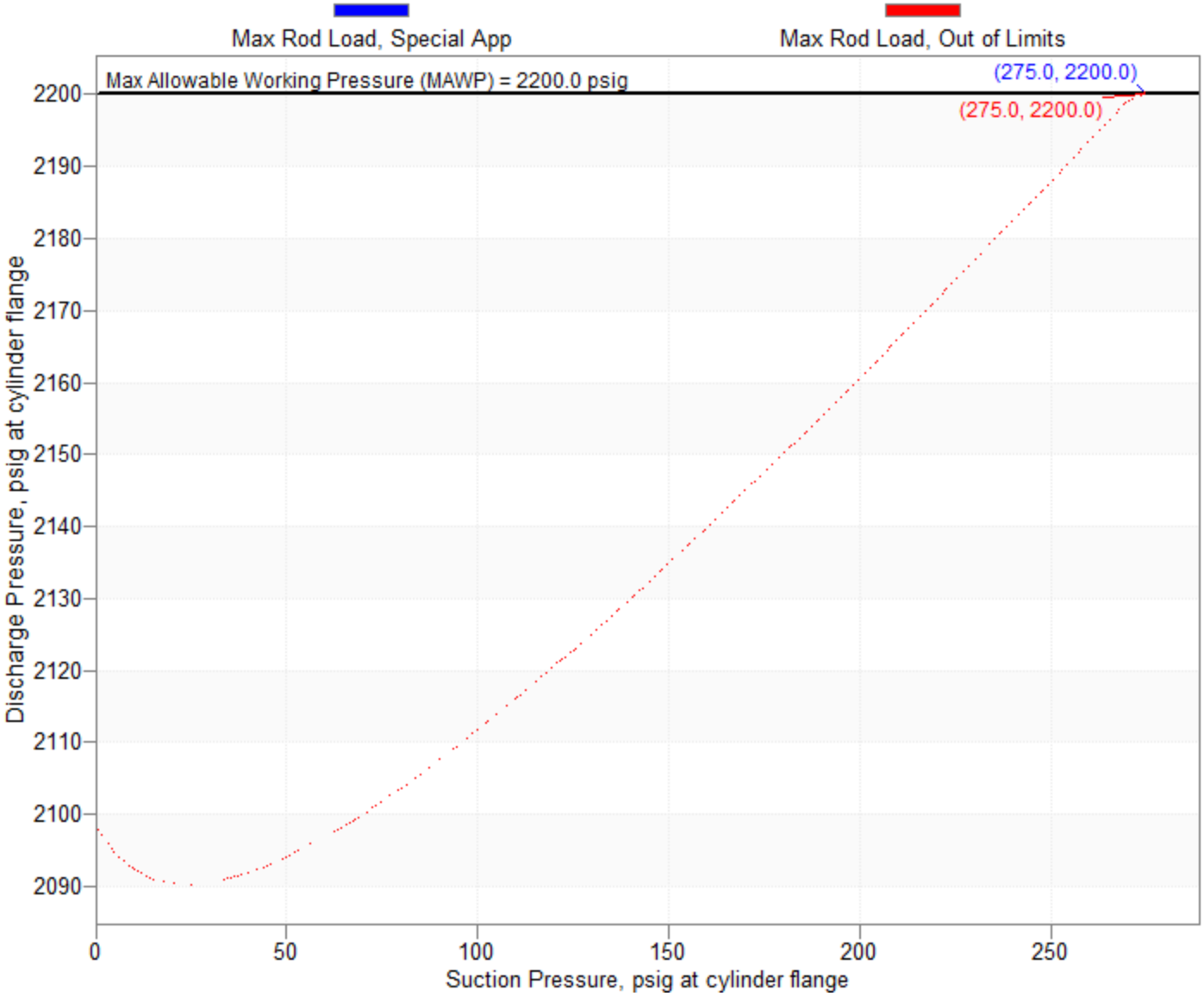
This chart defines allowable operating limits for gas rod loads and standard working pressures. Pressure combinations falling above the line will exceed the Rod Load limitations of the equipment. Values are undefined when suction pressure exceeds discharge pressure.

Base conditions for calculations are 60 °F at 1800 ft elevation.

Estimated Cylinder Gas Rod Load and Pressure Limits

Model: 3-7/8RJ **Bore: 3.625 in** **MAWP: 2200.0 psig**

			Special App	Out of Limits		
Frame	JGJ/4	Max RL Comp, lbf	23000	23000	Frame Serial No.	
Stroke, in	3.50	Max RL Tens, lbf	21000	21000	Cyl Serial No.	
Operating RPM	1800.0	Max RL Tot, lbf	42000	42000	Specific Gravity	1.0124
Action	DBL					



Dashed Line - Pressures above RDP. Please refer to the Application Manual.

These application limits must also be checked:

- Maximum allowable discharge temperature (MUST be less than 350 °F)
- Minimum allowable volumetric efficiency
- Crosshead pin load reversals

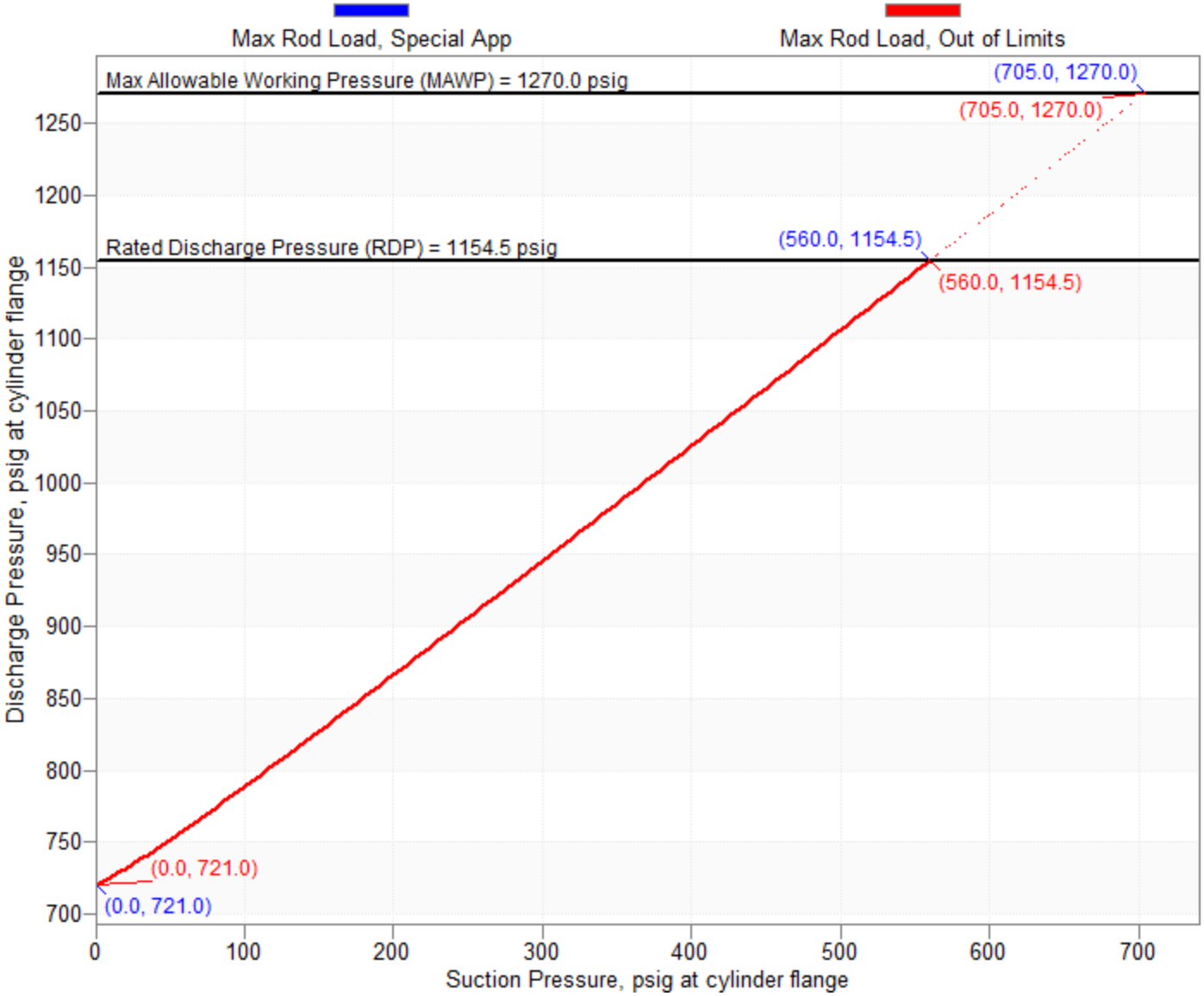
This chart defines allowable operating limits for gas rod loads and standard working pressures. Pressure combinations falling above the line will exceed the Rod Load limitations of the equipment. Values are undefined when suction pressure exceeds discharge pressure.

Base conditions for calculations are 130 °F at 1800 ft elevation.

Estimated Cylinder Gas Rod Load and Pressure Limits

Model: 6-3/8RJ **Bore: 6.000 in** **MAWP: 1270.0 psig**

			Special App	Out of Limits		
Frame	JGJ/4	Max RL Comp, lbf	23000	23000	Frame Serial No.	
Stroke, in	3.50	Max RL Tens, lbf	21000	21000	Cyl Serial No.	
Operating RPM	1800.0	Max RL Tot, lbf	42000	42000	Specific Gravity	1.0124
Action	DBL					



Dashed Line - Pressures above RDP. Please refer to the Application Manual.

These application limits must also be checked:

- Maximum allowable discharge temperature (MUST be less than 350 °F)
- Minimum allowable volumetric efficiency
- Crosshead pin load reversals

This chart defines allowable operating limits for gas rod loads and standard working pressures. Pressure combinations falling above the line will exceed the Rod Load limitations of the equipment. Values are undefined when suction pressure exceeds discharge pressure.

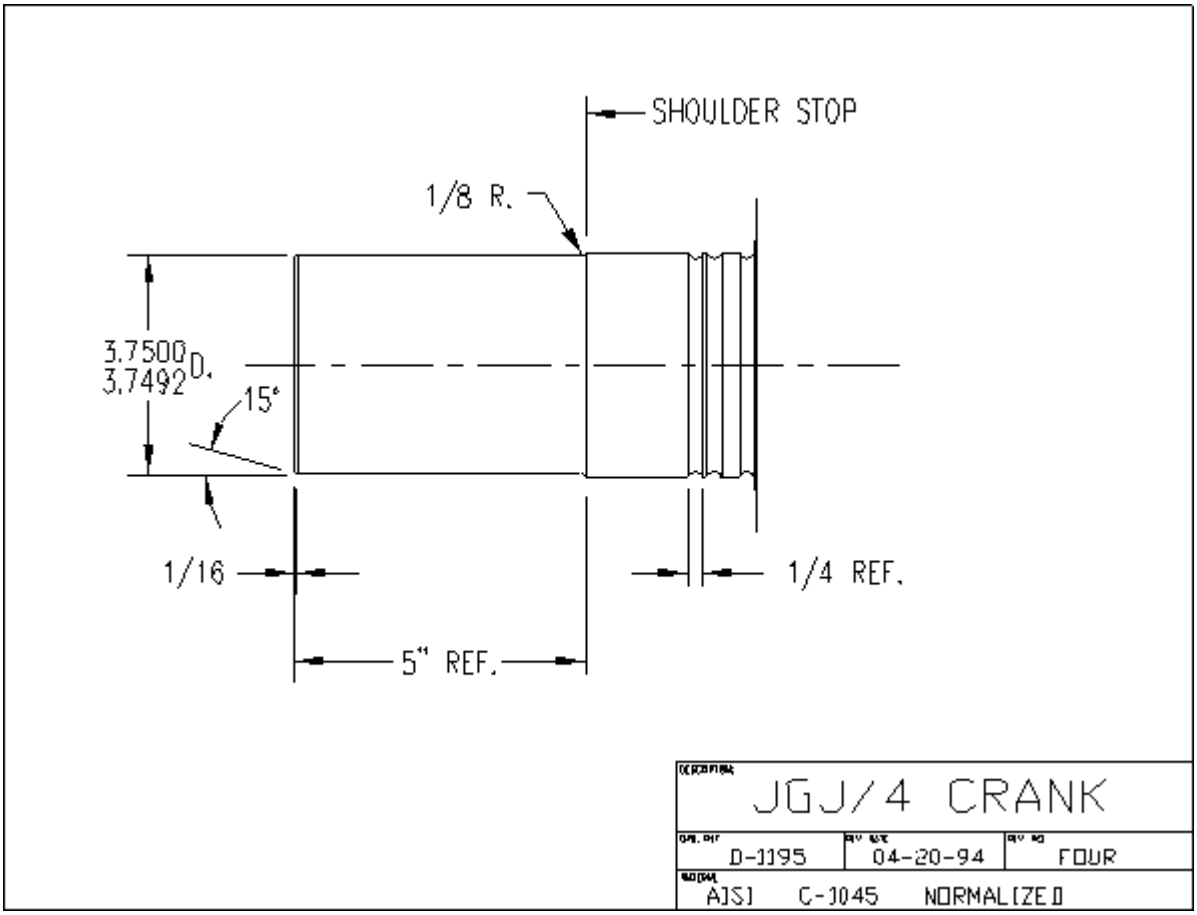
Base conditions for calculations are 130 °F at 1800 ft elevation.

Frame: JGJ/4 Stroke: 3.50 in Conrod Center Dist: 10.25 in Rotation: Clockwise

The following limits are for any individual harmonic. If more than one significant individual harmonic exists at a single speed with amplitude levels near the limit, an overall level should be examined and discussed with Ariel Corporation's Field Service Department.
Ariel Corporation Dec 1, 2006

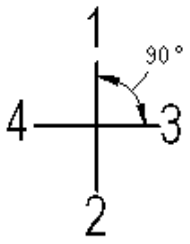
Compressor Auxiliary-End Drive Design	Ariel Compressor Frames Included	Acceptable Compressor Auxiliary End Vibration Limits (degrees 0-peak)
Single Chain	• All single throw frames • All 2 & 4 throw frames in classes JG:A:M:P:N:Q:W:R:J:H:E:K:T:C:D • JGA/6 & JGJ/6 • Older 6 throw JGC:D frames shipped before **Sept. 16, 2002** (approximate frame serial number F18137)	**1** degree for first harmonic (1X) **1** degree for engine induced ½ orders from ½ to 1-1/2X **½** degree for second harmonic (2X) **¼** degree for harmonics above second (>2X) **¼** degree for engine induced ½ orders greater than 2X
Dual Chain	• All 2 throw frames in classes JGZ:U • All 4 throw frames in classes JGZ:U:B:V:KBB:KBV • 6 throw JGE:K:T:Z:U:B:V:KBB:KBV • Newer 6 throw JGC:D frames shipped after **Sept. 16, 2002** (approximate frame serial number F18137)	**2** degree for first harmonic (1X) **2** degree for engine induced ½ orders from ½ to 1-1/2X **1** degree for second harmonic (2X) **½** degree for harmonics above second (>2X) **½** degree for engine induced ½ orders greater than 2X

Frame: JGJ/4 Stroke: 3.50 in Conrod Center Dist: 10.25 in Rotation: Clockwise



Frame: JGJ/4 Stroke: 3.50 in Conrod Center Dist: 10.25 in Rotation: Clockwise

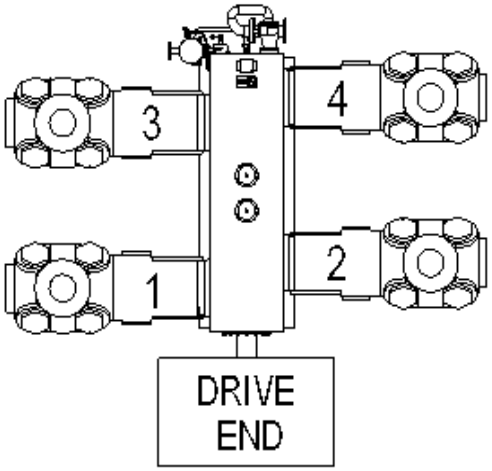
CYLINDER CRANK PIN
LOCATIONS VIEWED FROM DRIVE END
TOWARDS AUX END.



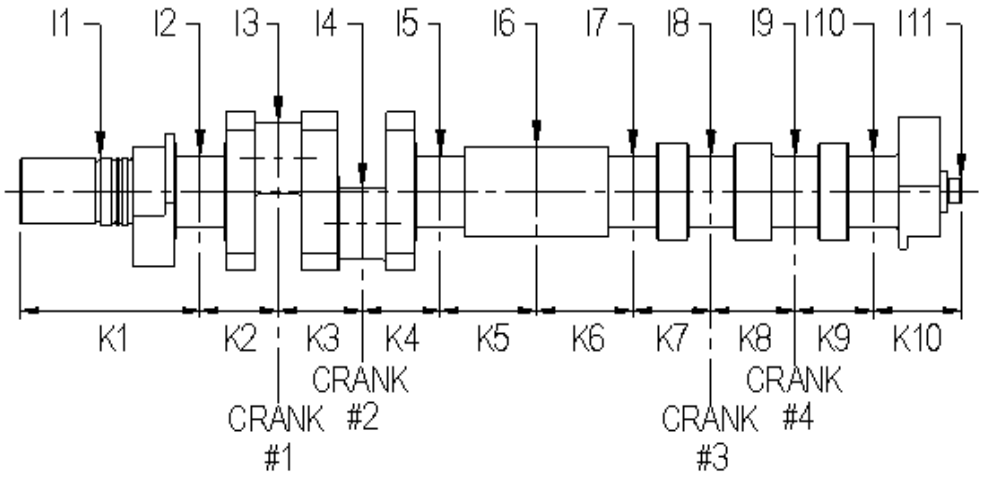
PHASE ANGLES (STD ROTATION):

THROWS:	LAGGING:	LEADING:
1:2	0 DEG.	0 DEG.
3:4	270 DEG.	90 DEG.

CYLINDER THROW POSITION



MASS ELASTIC DATA - STATION IDENTIFICATION



I = INERTIA
K = STIFFNESS

NOTES:

1. REFER TO MASS ELASTIC DATA SHEET FOR CRANKSHAFT MATERIAL PROPERTIES.
2. STANDARD ROTATION IS CLOCKWISE WHEN VIEWING THE FRAME DRIVE END. REVERSE ROTATION IS COUNTER-CLOCKWISE.

ARIEL CORPORATION
35 BLACKJACK ROAD
MOUNT VERNON, OHIO 43050

TITLE: MASS ELASTIC DATA
4 THROW HUB SHAFT

DRAWN: CPM 11/05/09
SCALE: NONE
DWG.No: IL-0377

Weights & Couples Data

7.6.7.0	Company:	Enerflex Energy Systems	Customer:	EOG Resources
	Quote:	42622-42623	Inquiry:	2.0 MMSCFD
	Case 1:	Design Pt	Project:	Gas Lift Compressors

Frame: JGJ/4 Stroke,in: 3.50 ConRod Center Dist, in: 10.25
Unit Weight: 7470.00 lbs Max Recip Weight (lbs) at 1800.0 RPM: 220.90

Install Weights:

Throw	Cyl Model	Bore in	C-Rod lbs	Piston + Rod	X-Head Part #	X-Head lbs		Bal Nut Part #	Bal Nut lbs		Recip Weight	Imb 1.0
1	8-3/8RJ	8.000	39.50	55.10	D-0239	32.90	S	B-0314	2.40	S	129.90	
2	3-7/8RJ	3.625	39.50	21.34	D-0241	54.00	S	B-0317-A	14.30	S	129.14	0.8
3	8-3/8RJ	8.000	39.50	55.10	D-0239	32.90	S	B-0314	2.40	S	129.90	
4	6-3/8RJ	6.000	39.50	49.10	D-0239	32.90	S	B-0422	8.40	S	129.90	0.0

LEGEND:

Imb - Opposing Throws are NOT Balanced
Recip Weight - Can't exceed max recip weight @ rated speed.
X-Head and Nut Part Legend:
A - Part is from Available Parts List
NS - Non-Standard Part
SP - Non-Standard Part: Guide (JG:A) or crankshaft (M:N:P:Q) must be removed to install.
S - Standard Part
B is in front of any above if Balancing X-Head
Legend - Manual Part Selection

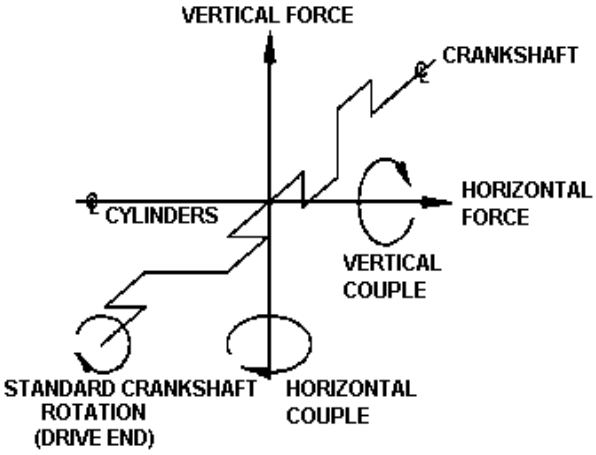
UNBALANCED FORCES & COUPLES

Horizontal	Primary	Secondary
Force, KIP at Max Imb: 1.00 lbs	0.228	0.055
Force, KIP (actual weights)	0.122	0.021
Couple, KIP-ft	5.474	0.024

Vertical	Primary
Force, KIP	0.000
Couple, KIP-ft	6.343

(Forces/Couples are Zero(0) to Peak)

COMPRESSOR INERTIAL FORCE & TORQUE REACTIONS



CROSSHEAD GUIDE DEFLECTION

Throw	Guide Type	Cyl Wt lbs	Pkt Wt lbs	Other Wt lbs	Total Wt lbs	Deflection in
1	STD	910.00	161.00	0.00	1071.00	0.003
2	STD	660.00	78.00	0.00	738.00	0.002
3	STD	910.00	161.00	0.00	1071.00	0.003
4	STD	1050.00	140.00	0.00	1190.00	0.003

IMPORTANT NOTE: Crosshead top and bottom clearance and Piston Rod Run-out should be measured after shimming.