

Golden Company Ltd.
100/00-00-000-00 WOM/00
Surface: 00-00-000-00 WOM
Prepared for: William Domore



Prepared by: Scott Finnestad (403) 309-2620
xxxx-09-24

Dynamometer Design Analysis

Purpose of design:

The purpose of this design is to evaluate pumping conditions of an existing well at various pumping speeds and pump sizes based on a previous dynamometer test on xxxx-09-16.

Recommendation:

Five design runs are conducted. Please see next page for a design run summary and attached individual design run for details.

Design run #4 is recommended if a greater inflow is not anticipated and current pump displacement is to be maintained. Design run #4 - utilize existing rod string, replace current 1.75 inch pump with a 1.50 inch pump, and increase pumping speed to 6.5 spm.

Design run #5 is recommended if a greater inflow is anticipated. Design run #5 – replace existing API 86 grade D rod string with an API 76 Norris 97 high strength string, and increase pumping speed to 7.0 spm.

You may consider a pressure survey, a fluid depression test and an IPR calculation to determine the production potential. The pressure survey will also provide information on wellbore conditions if scaling appears to be an issue.

Dynamometer Design Summary 100/00-00-000-00 WOM/00

Design Run #	Pump Size / Displacement (in) / (m3pd)	Pumping Speed (spm)	Stroke Length (in)	Structure Loading (%)	Rod Loading (%Goodman, 0.8 s.f.) (%)	Gearbox		Motor Loading (hp)	Fluid Production (m3pd)
						Loading (%)	Required CB (in-lbs)		
#1: loading from a previous dyno test (xxxx-09-16)	1.75 / 23.57	4.5	107.0	75.2	87.5	101.4	798,000	14.2	20.4
#2: existing rod string @ 4.8 spm (pumping conditions during fluid level on xxxx-09-23)	1.75 / 24.54	4.8	107.0	76.1	99.7	109.2	806,600	16.3	20.4
#3: existing rod string @ 7.0 spm	1.75 / 36.26	7.0	107.0	77.9	111.8	116.0	807,900	25.3	20.4
#4: existing rod string with 1.50" pump @ 6.5 spm	1.50 / 26.18	6.5	107.0	74.6	92.0	105.8	795,800	21.0	20.4
#5: Norris 97 high strength rod string @ 7.0 spm	1.75 / 35.00	7.0	107.0	59.6	61.9	101.7	565,000	22.2	20.4

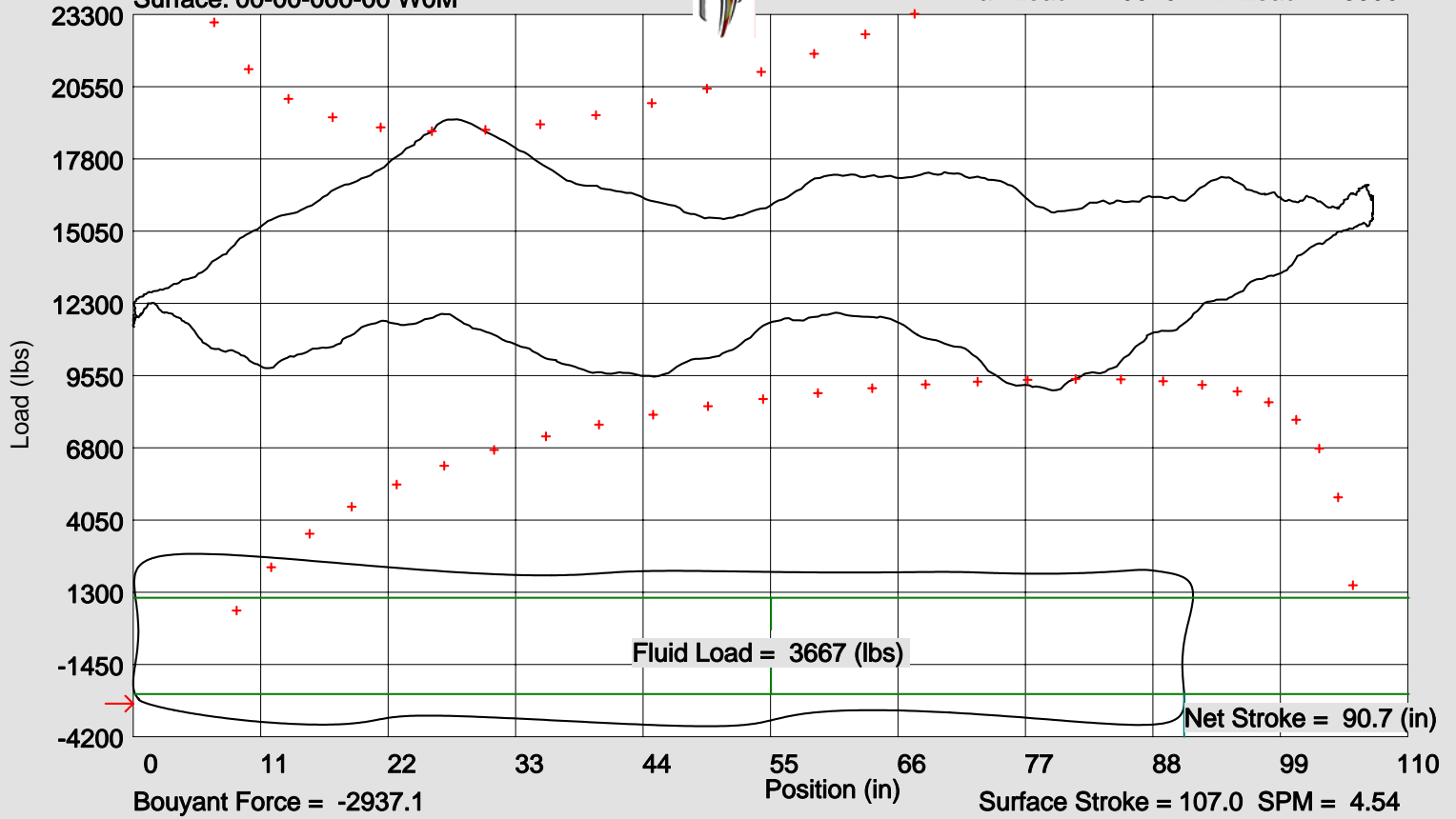


Prepared by: Scott Finnestad (403) 309-2620
xxxx-09-24

Downhole: 100/00-00-000-00 WOM/00
Surface: 00-00-000-00 WOM



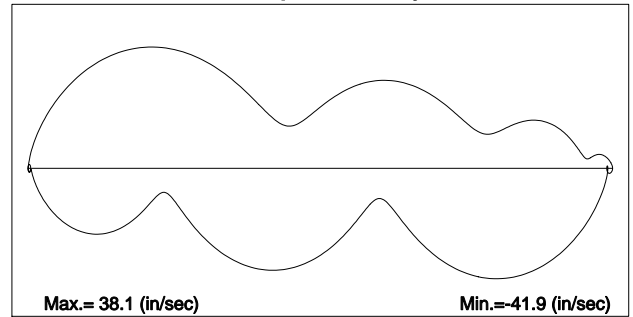
Max Load = 19310 Min Load = 8990



Rod Loading

Depth (m)	Rod Size (mm)	Loads		% Goodman Range Service Factor of		
		Max (lbs)	Min (lbs)	(1.0)	(0.9)	(0.8)
				0.00	31.8	19210.0
7.92	25.4	18518.5	9375.0	49.5	58.3	70.8
504.43	22.2	13702.5	5044.7	57.4	66.3	78.3
1007.35	19.0	9901.9	1954.5	67.1	75.9	87.5
1624.57	31.8	4257.8	-2686.6	25.5	28.0	31.1
1700.77	31.8	2766.2	-3798.5	23.7	25.9	28.6

Pump Velocity



Current Production

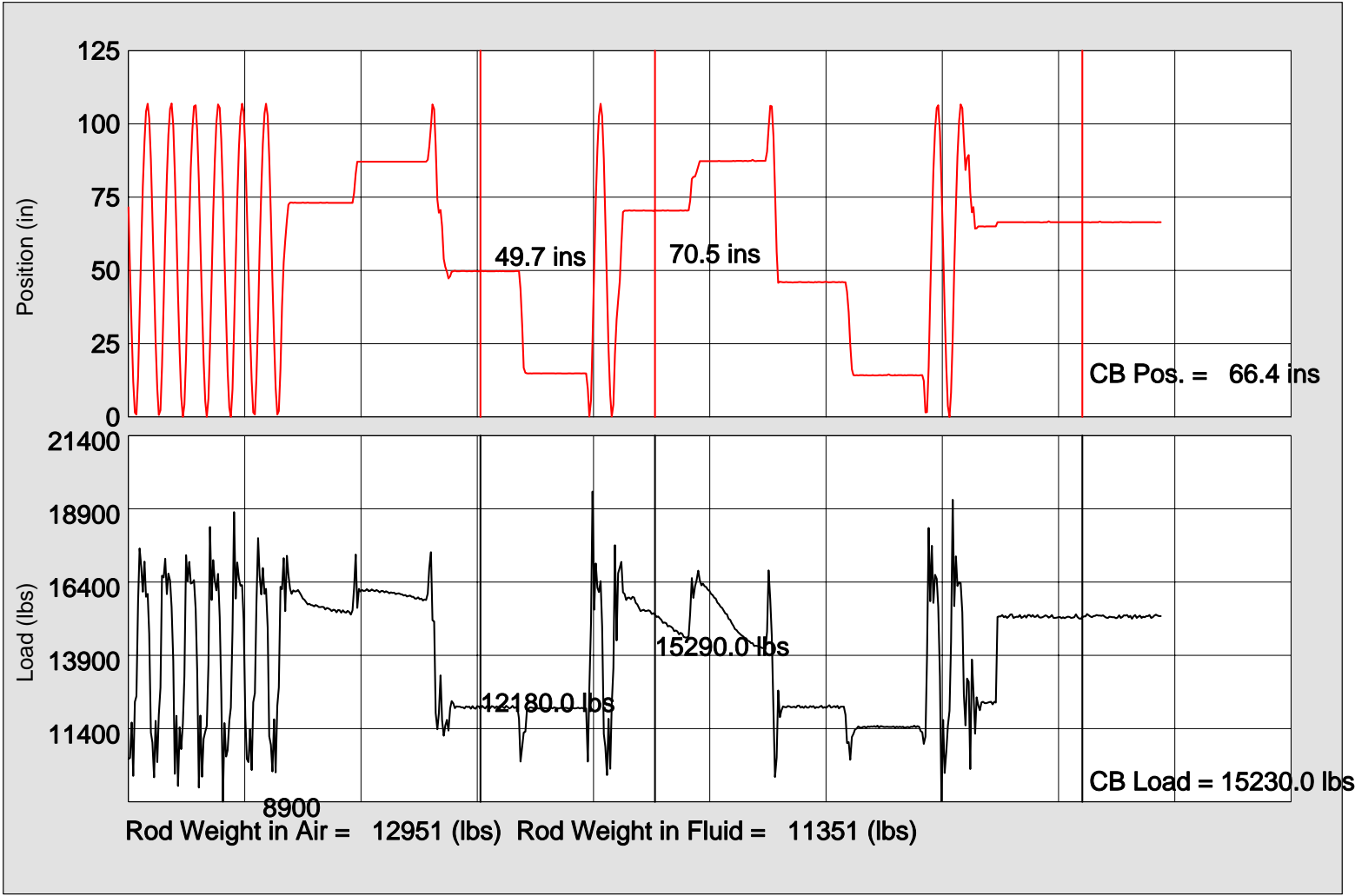
Oil (m3/day):	2.40
Water (m3/day):	18.00
Gas (E3m3/day):	2.00

Pump Efficiencies

Pump Size (in): 1.75	Gross	Net
Downhole Stroke (in):	91.47	90.70
Displacement (m3/day):	23.57	23.37
Efficiency (%)	86.55	87.29



Nelgar Design Run





Nelgar Design Run

Tbg
1113.00
kPa

Design #4 equipment loading from a previous dynamometer test

1098.00
kPa

Elevations:
KB (m): 836.47
CF (m): 831.50

Casing:
OD (mm): 139.70
ID (mm): 122.58
Weight(kg/m): 23.10
Depth (mKB): 1735.00

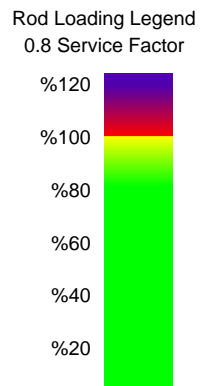
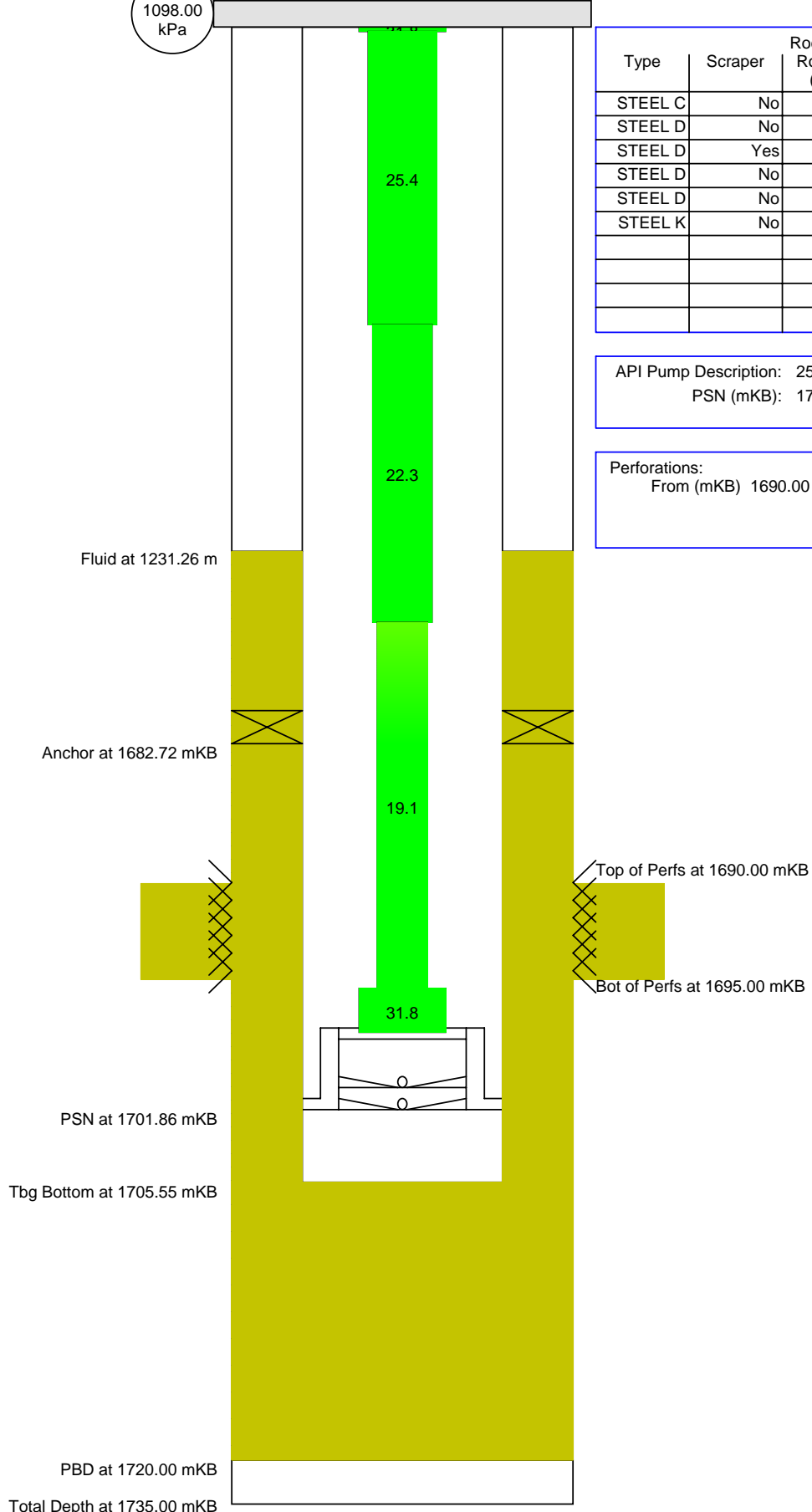
Tubing:
OD (mm): 73.00
ID (mm): 62.00
Weight(kg/m): 9.67
Depth (mKB): 1705.55
Number of Jts: 179

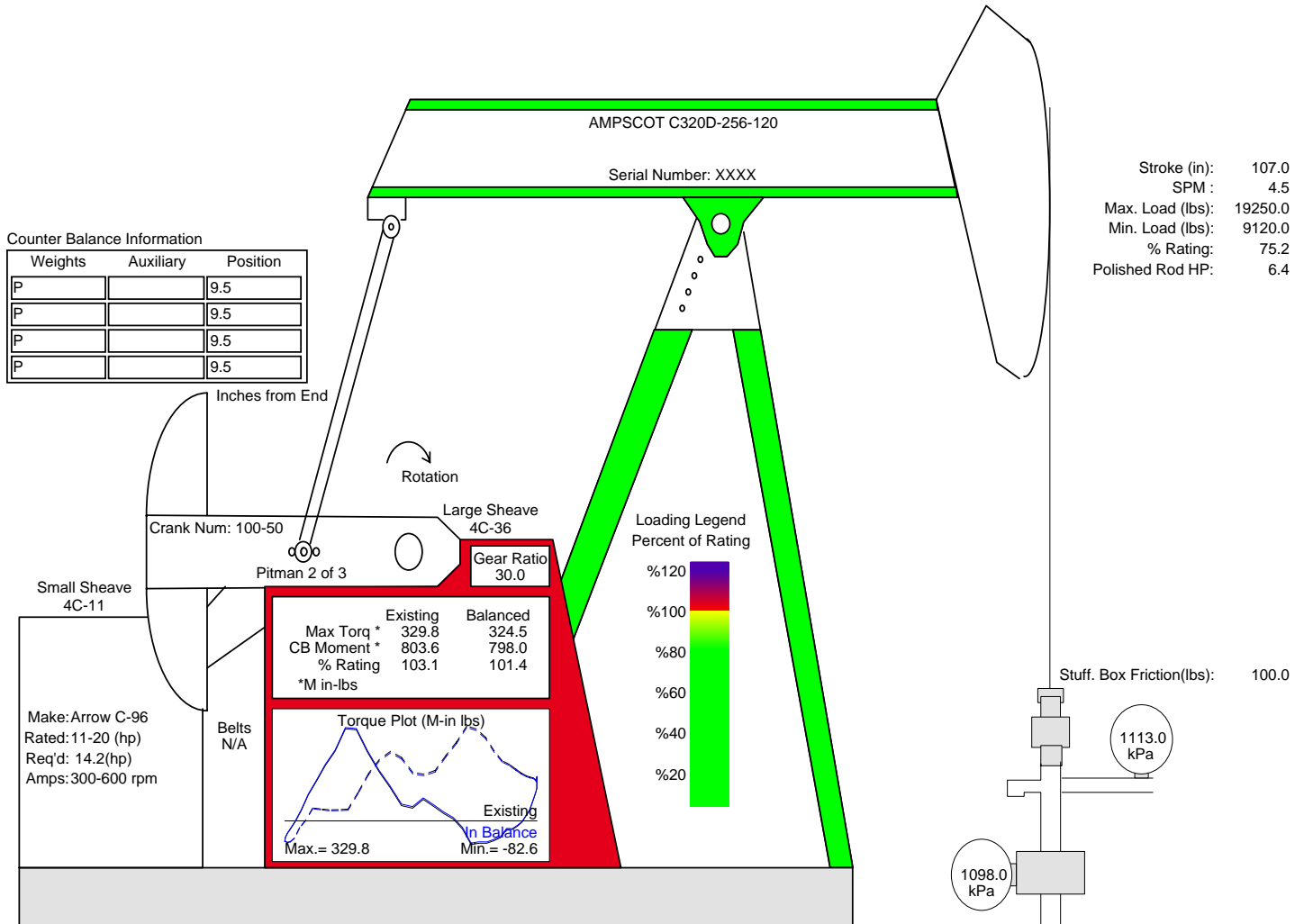
Liner:
ID (mm): 0.00
Top (mKB): 0.00
Bottom(mKB): 0.00

Type	Scraper	Rod String Rod Dia. (mm)	# Rods	Length (m)
STEEL C	No	31.80	1	7.92
STEEL D	No	25.40	1	1.21
STEEL D	Yes	25.40	65	495.30
STEEL D	No	22.20	66	502.92
STEEL D	No	19.10	81	617.22
STEEL K	No	31.80	10	76.20

API Pump Description: 25-175 RHAC 16.0- 5.0- 4.0
PSN (mKB): 1701.86

Perforations:
From (mKB) 1690.00 to 1695.00

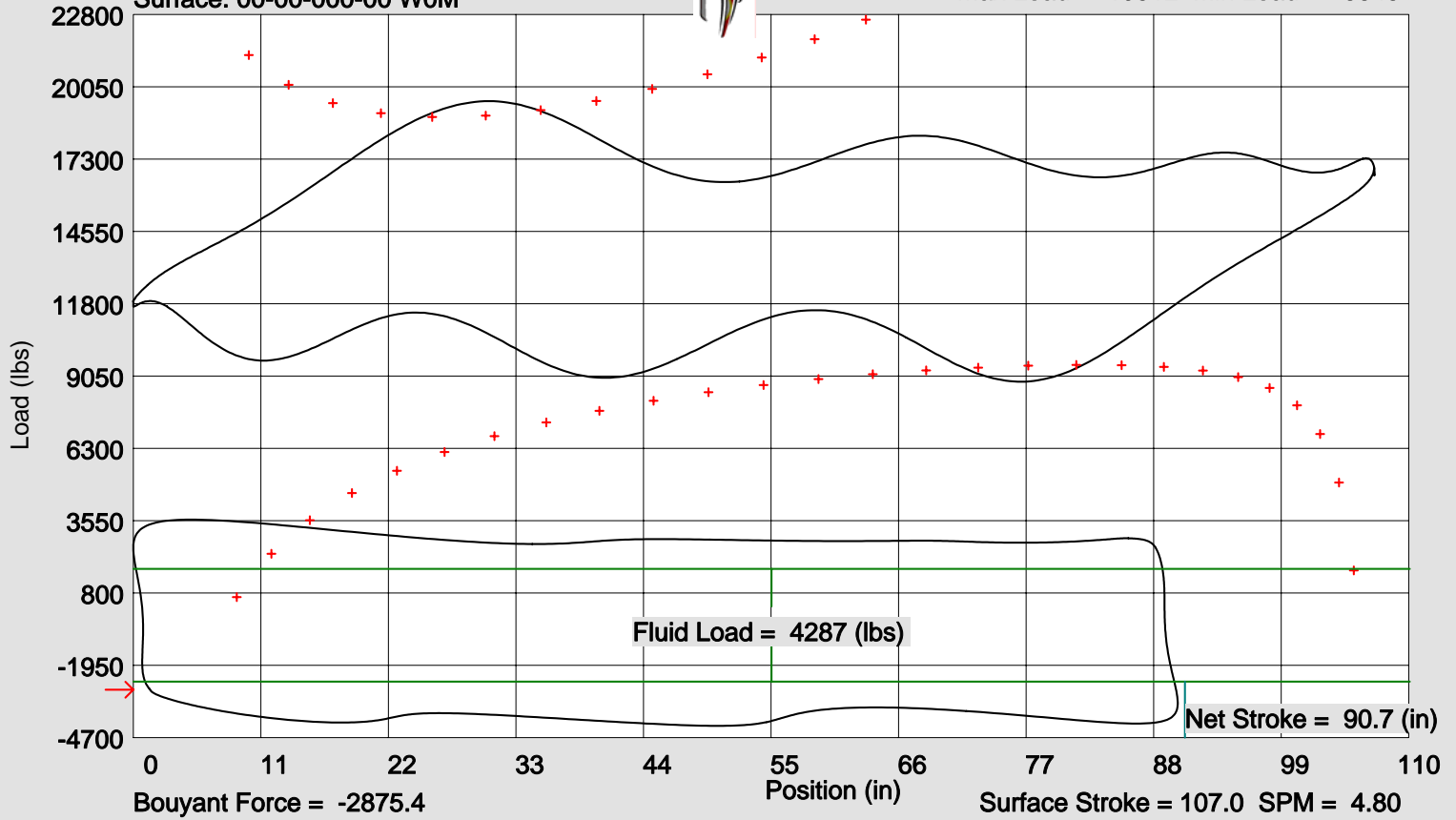




Downhole: 100/00-00-000-00 WOM/00
Surface: 00-00-000-00 WOM



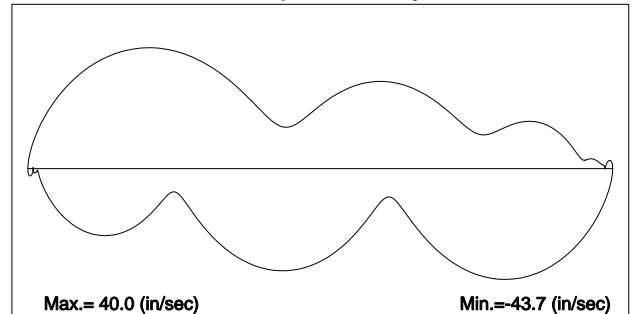
Max Load = 19512 Min Load = 8845



Rod Loading

Depth (m)	Rod Size (mm)	Loads		% Goodman Range Service Factor of		
		Max (lbs)	Min (lbs)	(1.0)	(0.9)	(0.8)
				0.00	31.8	19406.7
7.92	25.4	19345.1	8869.7	56.0	65.7	79.4
504.43	22.2	14574.3	4491.2	65.8	75.6	88.8
1007.35	19.0	10766.8	1405.6	77.5	87.2	99.7
1624.57	31.8	5111.9	-3158.6	30.1	33.0	36.6
1700.77	31.8	3594.3	-4249.2	28.1	30.7	33.8

Pump Velocity



Pump Efficiencies

Pump Size (in): 1.75	Gross	Net
Downhole Stroke (in):	90.09	90.70
Displacement (m3/day):	24.54	24.71
Efficiency (%)	83.12	82.55

Current Production

Oil (m3/day):	2.40
Water (m3/day):	18.00
Gas (E3m3/day):	2.00

Comments



Nelgar Design Run

Design #2 - existing rod string @ 4.8 spm (fluid level from xxxx-09-23)

Csg
865.00
kPa

Tbg
766.00
kPa

Elevations:
KB (m): 836.47
CF (m): 831.50

Casing:
OD (mm): 139.70
ID (mm): 122.58
Weight(kg/m): 23.10
Depth (mKB): 1735.00

Tubing:
OD (mm): 73.00
ID (mm): 62.00
Weight(kg/m): 9.67
Depth (mKB): 1705.55
Number of Jts: 179

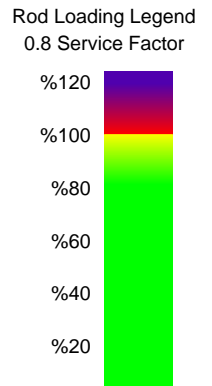
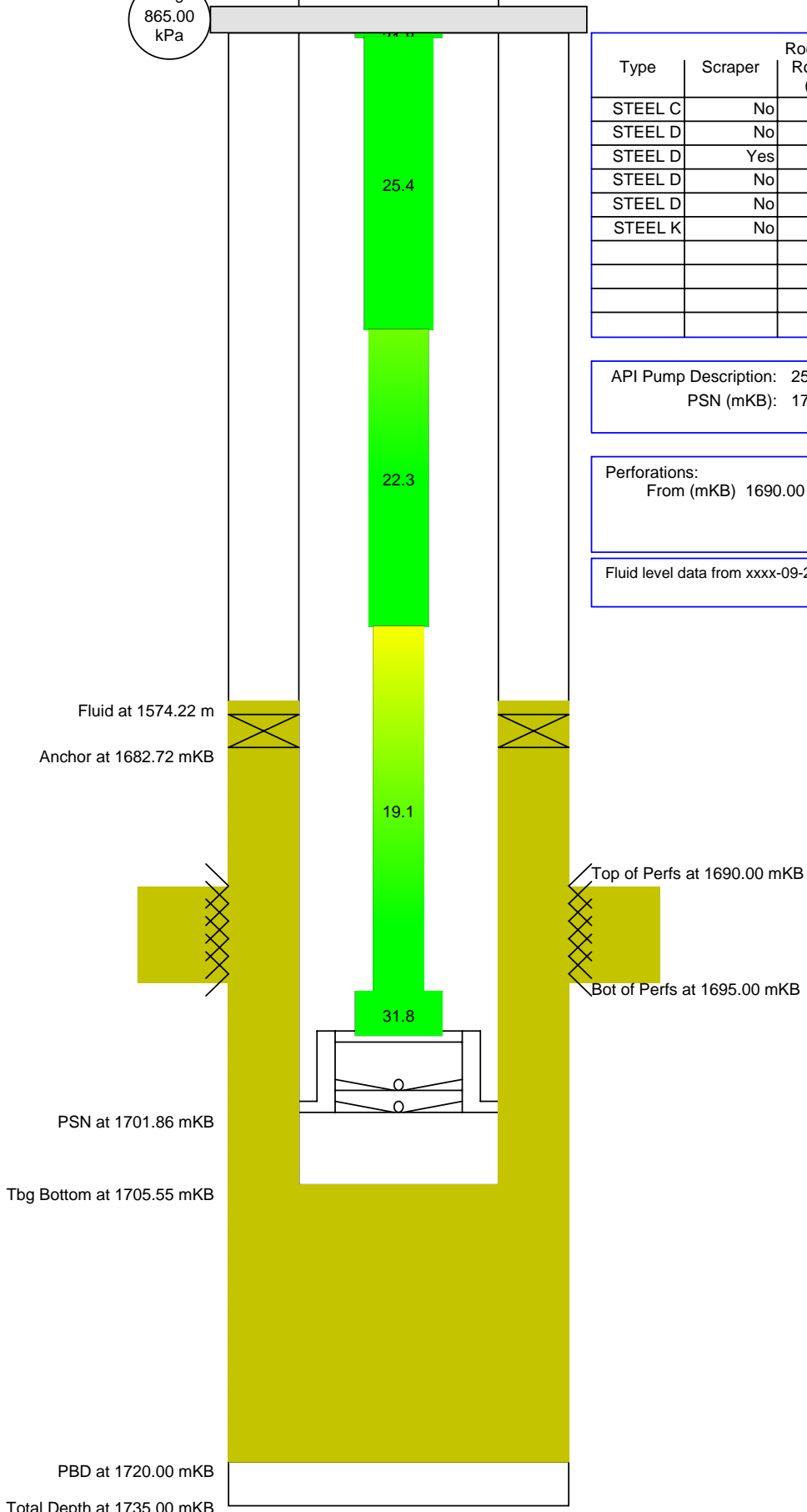
Liner:
ID (mm): 0.00
Top (mKB): 0.00
Bottom(mKB): 0.00

Type	Scraper	Rod String Rod Dia. (mm)	# Rods	Length (m)
STEEL C	No	31.80	1	7.92
STEEL D	No	25.40	1	1.21
STEEL D	Yes	25.40	65	495.30
STEEL D	No	22.20	66	502.92
STEEL D	No	19.10	81	617.22
STEEL K	No	31.80	10	76.20

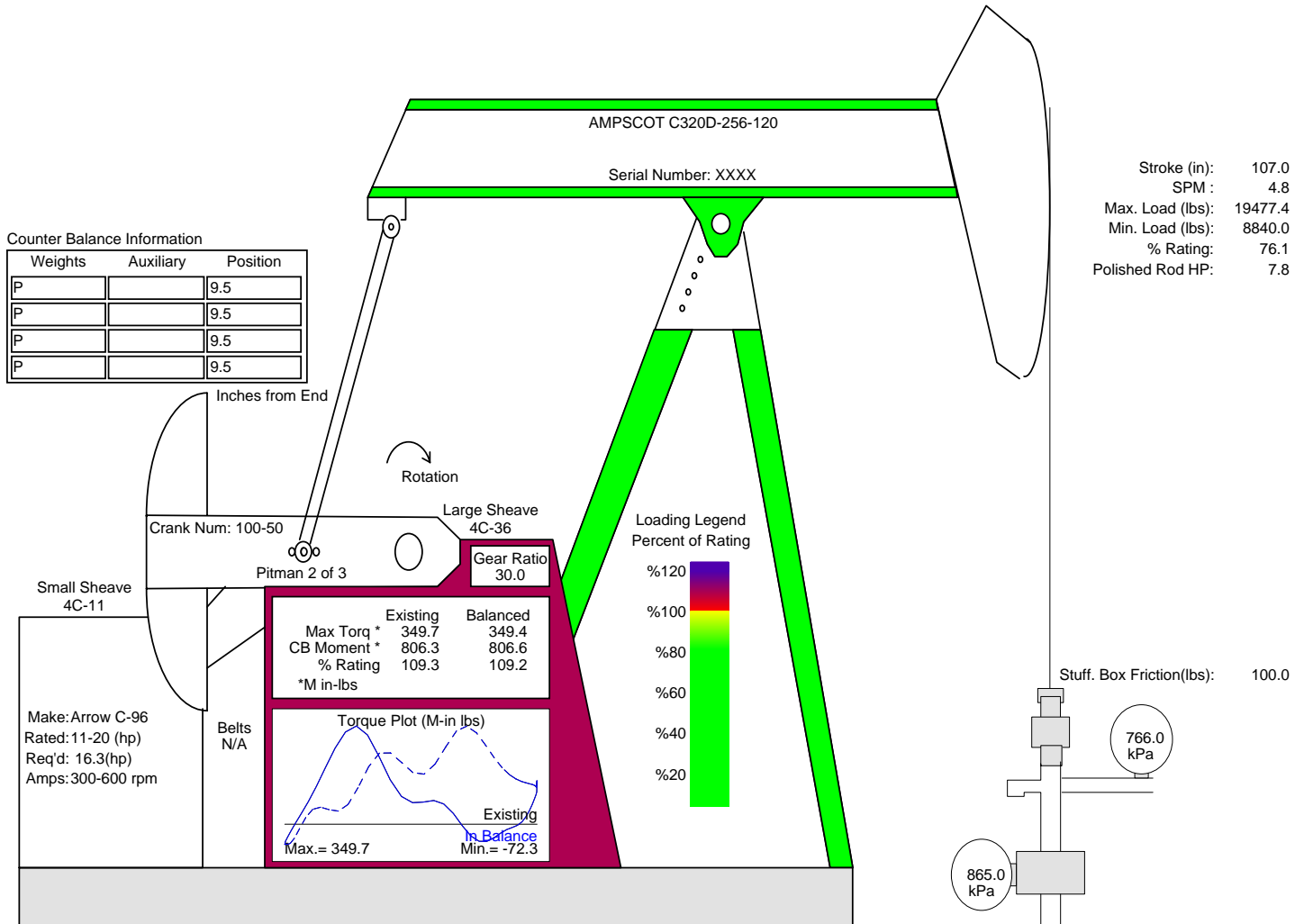
API Pump Description: 25-175 RHAC 16.0- 5.0- 4.0
PSN (mKB): 1701.86

Perforations:
From (mKB) 1690.00 to 1695.00

Fluid level data from xxxx-09-23.



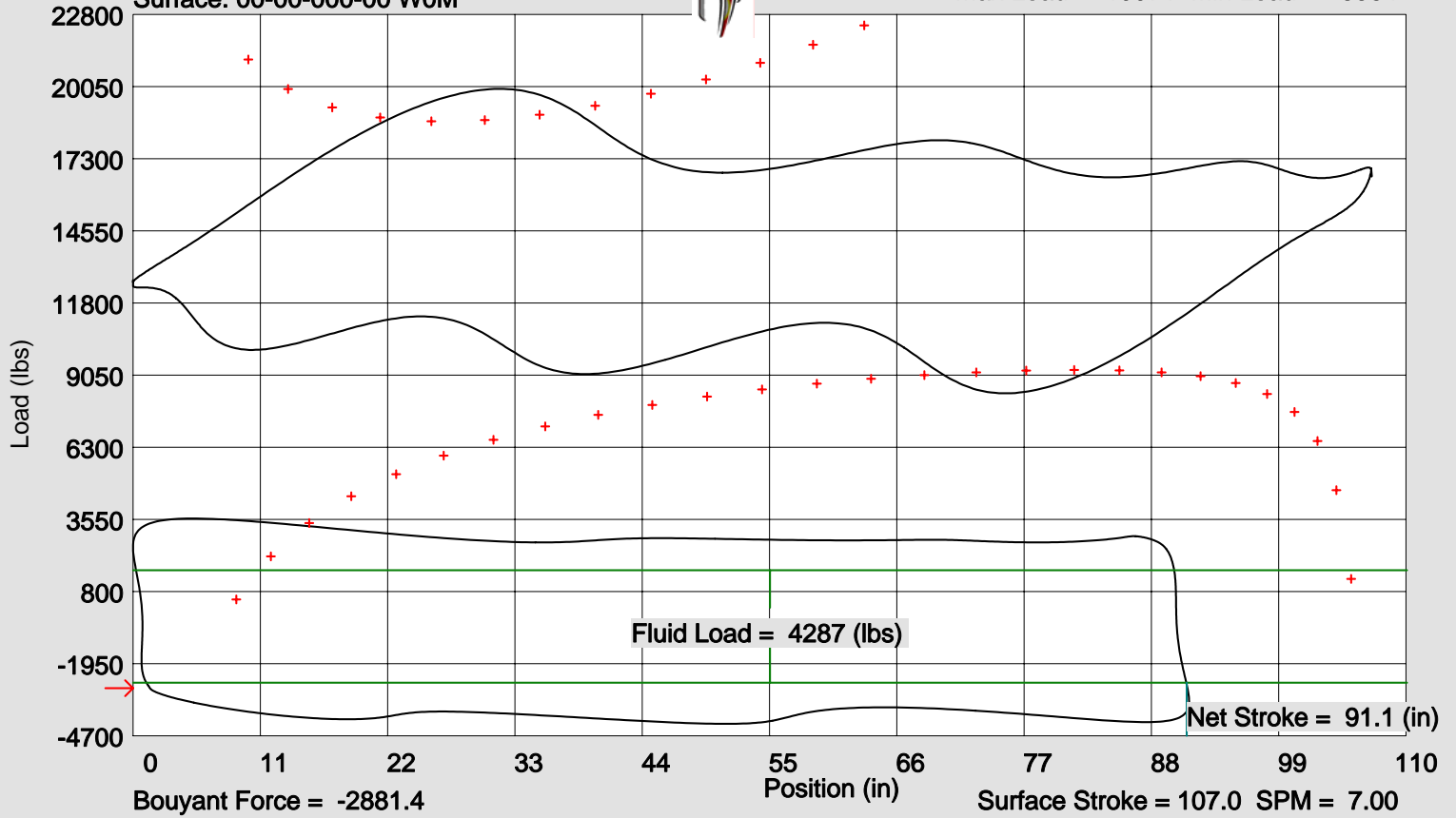
Nelgar Design Run



Downhole: 100/00-00-000-00 WOM/00
Surface: 00-00-000-00 WOM



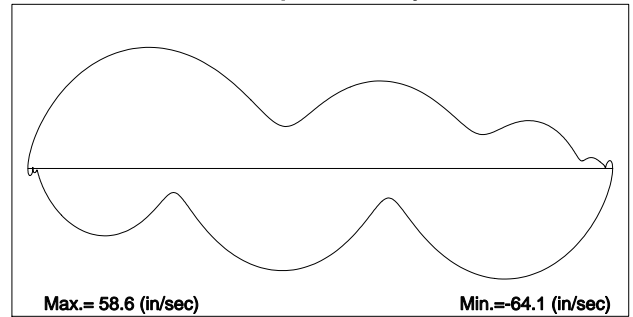
Max Load = 19971 Min Load = 8364



Rod Loading

Depth (m)	Rod Size (mm)	Loads		% Goodman Range Service Factor of		
		Max (lbs)	Min (lbs)	(1.0)	(0.9)	(0.8)
				0.00	31.8	19865.8
7.92	25.4	19818.7	8380.1	60.5	70.7	85.0
504.43	22.2	15460.6	3649.1	75.3	85.9	99.9
1007.35	19.0	11598.7	626.8	88.3	98.7	111.8
1624.57	31.8	5379.7	-3369.5	31.8	34.8	38.5
1700.77	31.8	3586.9	-4240.6	28.0	30.6	33.7

Pump Velocity



Current Production

Oil (m3/day):	2.40
Water (m3/day):	18.00
Gas (E3m3/day):	2.00

Pump Efficiencies

Pump Size (in): 1.75	Gross	Net
Downhole Stroke (in):	91.26	91.07
Displacement (m3/day):	36.26	36.18
Efficiency (%)	56.26	56.38

Comments



Nelgar Design Run

Design #3 - existing rod string @ 7.0 spm.

Csg
800.00
kPa

Tbg
800.00
kPa

Elevations:
KB (m): 836.47
CF (m): 831.50

Casing:
OD (mm): 139.70
ID (mm): 122.58
Weight(kg/m): 23.10
Depth (mKB): 1735.00

Tubing:
OD (mm): 73.00
ID (mm): 62.00
Weight(kg/m): 9.67
Depth (mKB): 1705.55
Number of Jts: 179

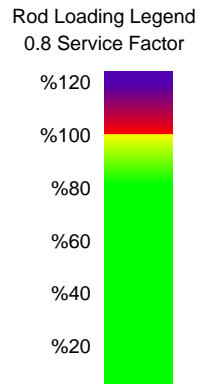
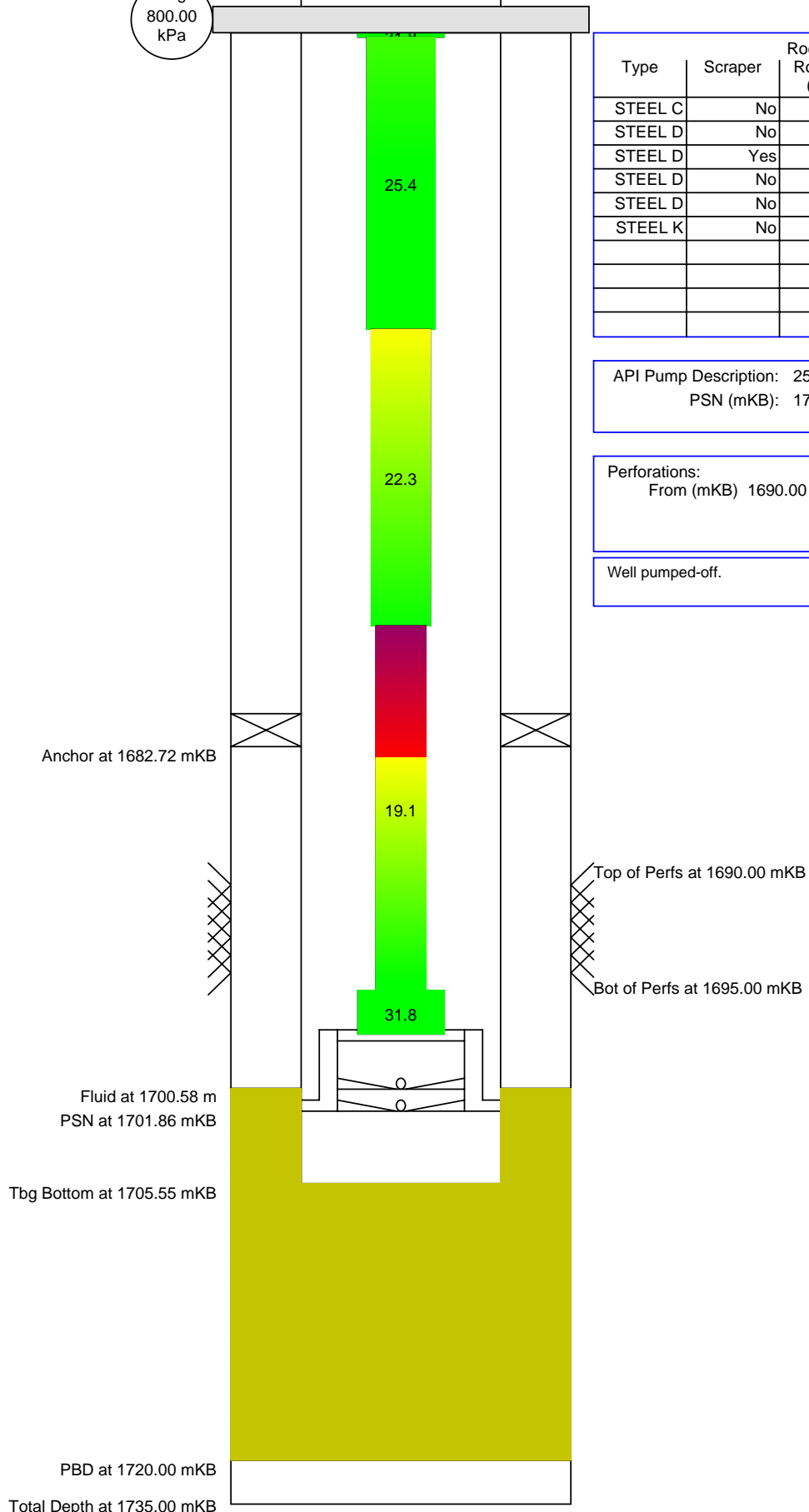
Liner:
ID (mm): 0.00
Top (mKB): 0.00
Bottom(mKB): 0.00

Type	Scraper	Rod String Rod Dia. (mm)	# Rods	Length (m)
STEEL C	No	31.80	1	7.92
STEEL D	No	25.40	1	1.21
STEEL D	Yes	25.40	65	495.30
STEEL D	No	22.20	66	502.92
STEEL D	No	19.10	81	617.22
STEEL K	No	31.80	10	76.20

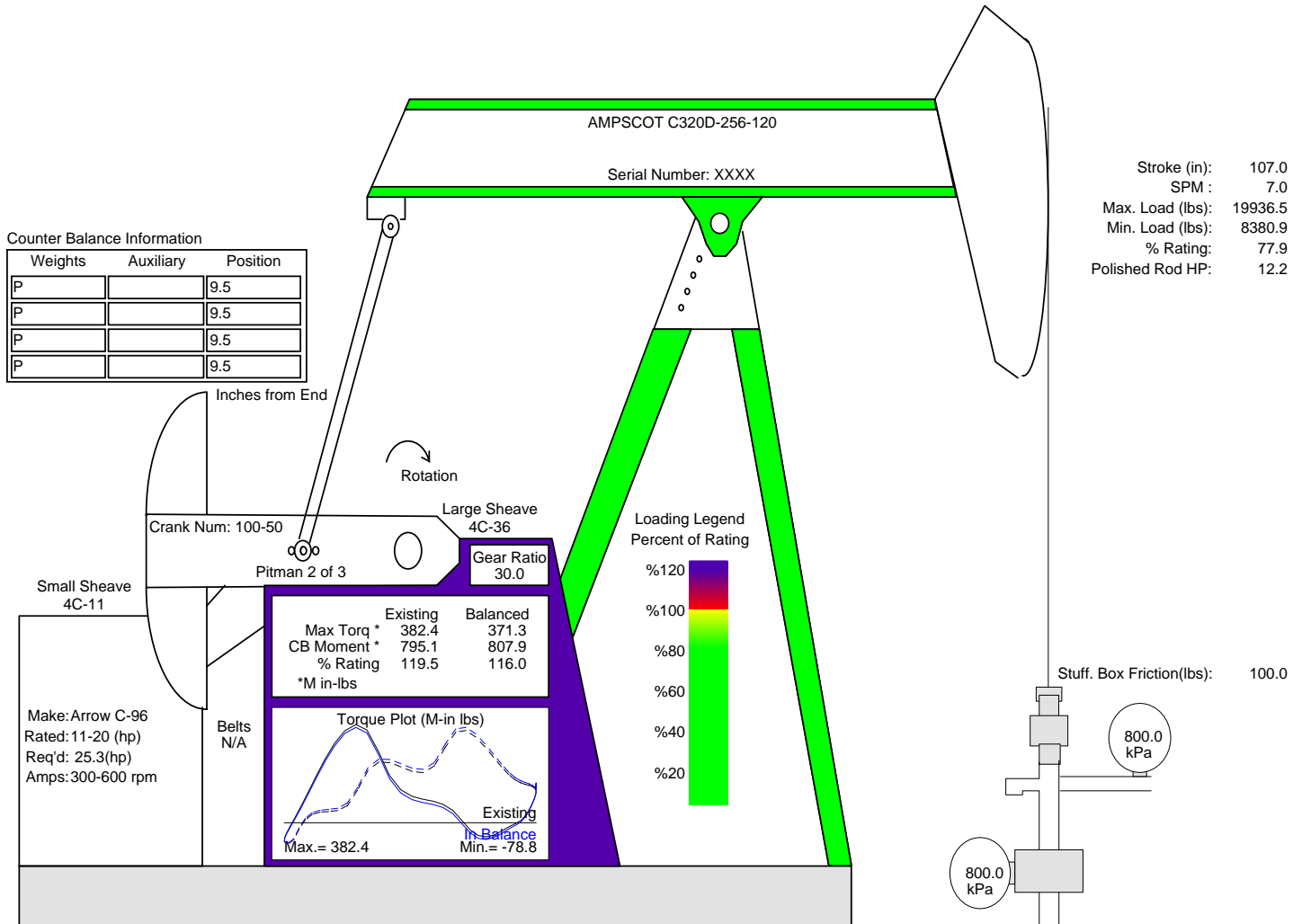
API Pump Description: 25-175 RHAC 16.0- 5.0- 4.0
PSN (mKB): 1701.86

Perforations:
From (mKB) 1690.00 to 1695.00

Well pumped-off.



Nelgar Design Run

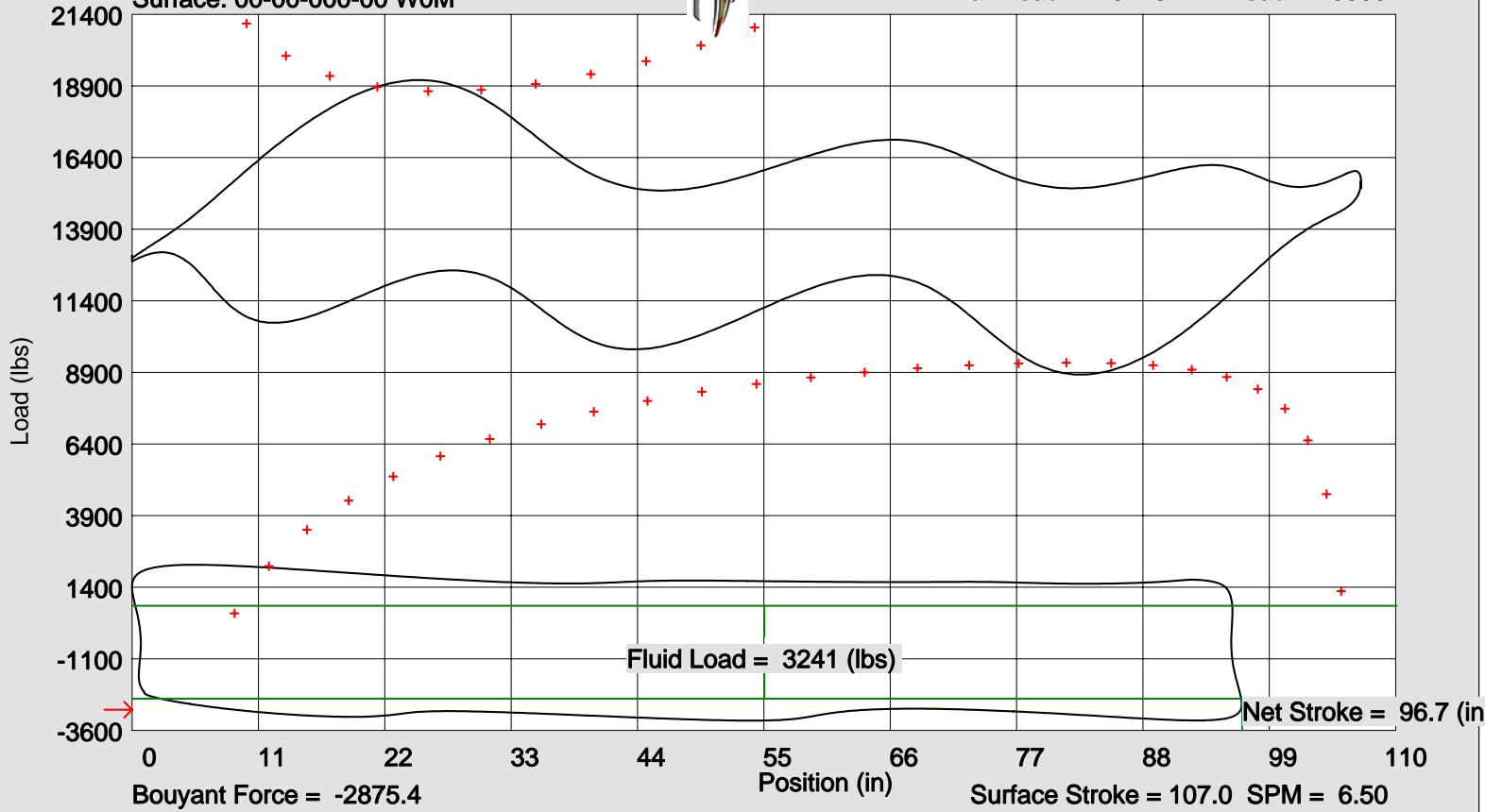


Nelgar Design Run

Downhole: 100/00-00-000-00 WOM/00
Surface: 00-00-000-00 WOM



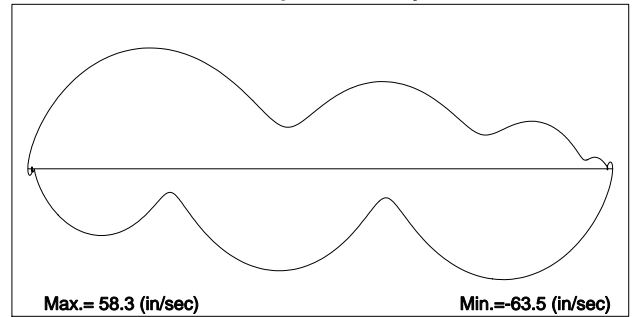
Max Load = 19113 Min Load = 8830



Rod Loading

Depth (m)	Rod Size (mm)	Loads		% Goodman Range Service Factor of		
		Max (lbs)	Min (lbs)	(1.0)	(0.9)	(0.8)
		0.00	31.8	19006.2	8930.3	42.5
7.92	25.4	18946.3	8854.2	53.9	63.3	76.5
504.43	22.2	14201.9	4453.5	63.6	73.0	85.7
1007.35	19.0	10142.2	1598.9	71.2	80.3	92.0
1624.57	31.8	3937.4	-2408.3	23.4	25.7	28.6
1700.77	31.8	2185.6	-3255.3	19.8	21.7	24.0

Pump Velocity



Pump Efficiencies

Pump Size (in): 1.50	Gross	Net
Downhole Stroke (in):	96.60	96.66
Displacement (m3/day):	26.18	26.20
Efficiency (%)	77.91	77.87

Current Production

Oil (m3/day):	2.40
Water (m3/day):	18.00
Gas (E3m3/day):	2.00

Comments



Nelgar Design Run

Design #4 - existing rod string with a 1.50" pump @ 6.5 spm

Tbg
800.00
kPa

Csg
800.00
kPa

Elevations:
KB (m): 836.47
CF (m): 831.50

Casing:
OD (mm): 139.70
ID (mm): 122.58
Weight(kg/m): 23.10
Depth (mKB): 1735.00

Tubing:
OD (mm): 73.00
ID (mm): 62.00
Weight(kg/m): 9.67
Depth (mKB): 1705.55
Number of Jts: 179

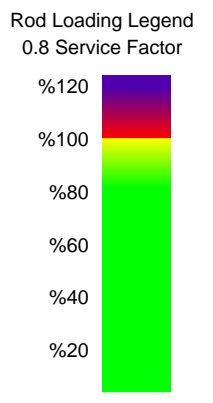
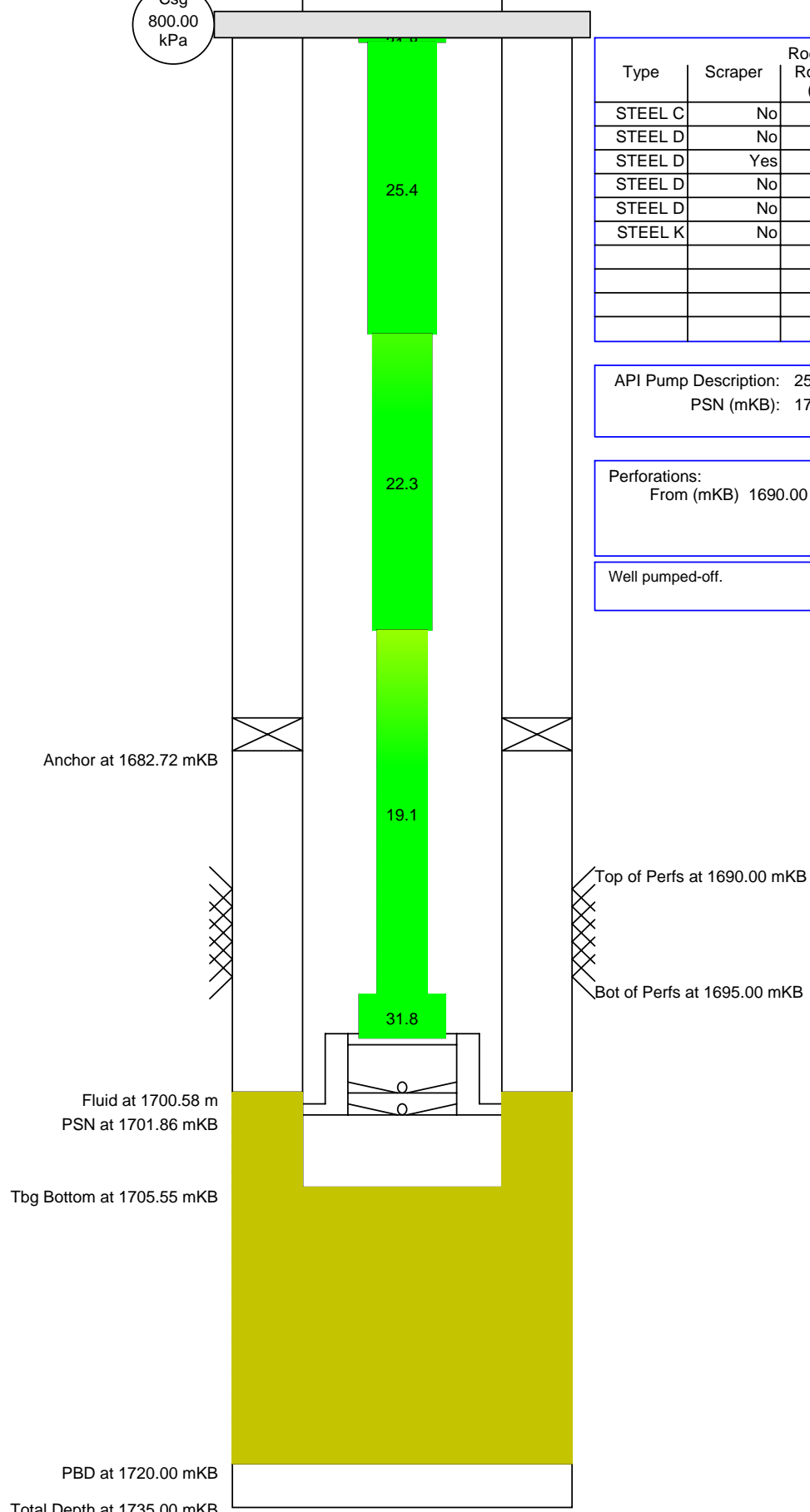
Liner:
ID (mm): 0.00
Top (mKB): 0.00
Bottom(mKB): 0.00

Type	Scraper	Rod String Rod Dia. (mm)	# Rods	Length (m)
STEEL C	No	31.80	1	7.92
STEEL D	No	25.40	1	1.21
STEEL D	Yes	25.40	65	495.30
STEEL D	No	22.20	66	502.92
STEEL D	No	19.10	81	617.22
STEEL K	No	31.80	10	76.20

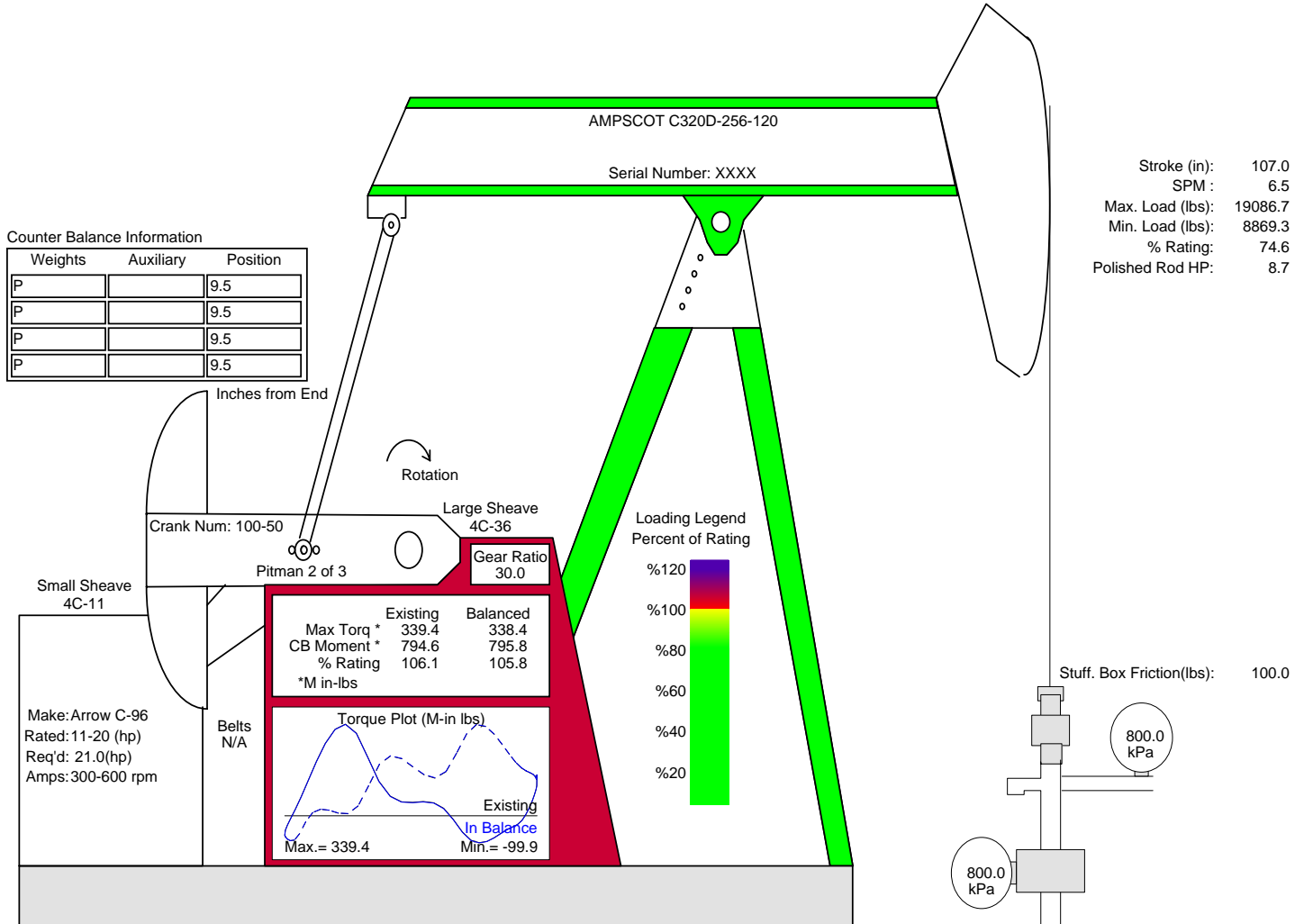
API Pump Description: 25-150 RHAC 16.0- 5.0- 4.0
PSN (mKB): 1701.86

Perforations:
From (mKB) 1690.00 to 1695.00

Well pumped-off.



Nelgar Design Run

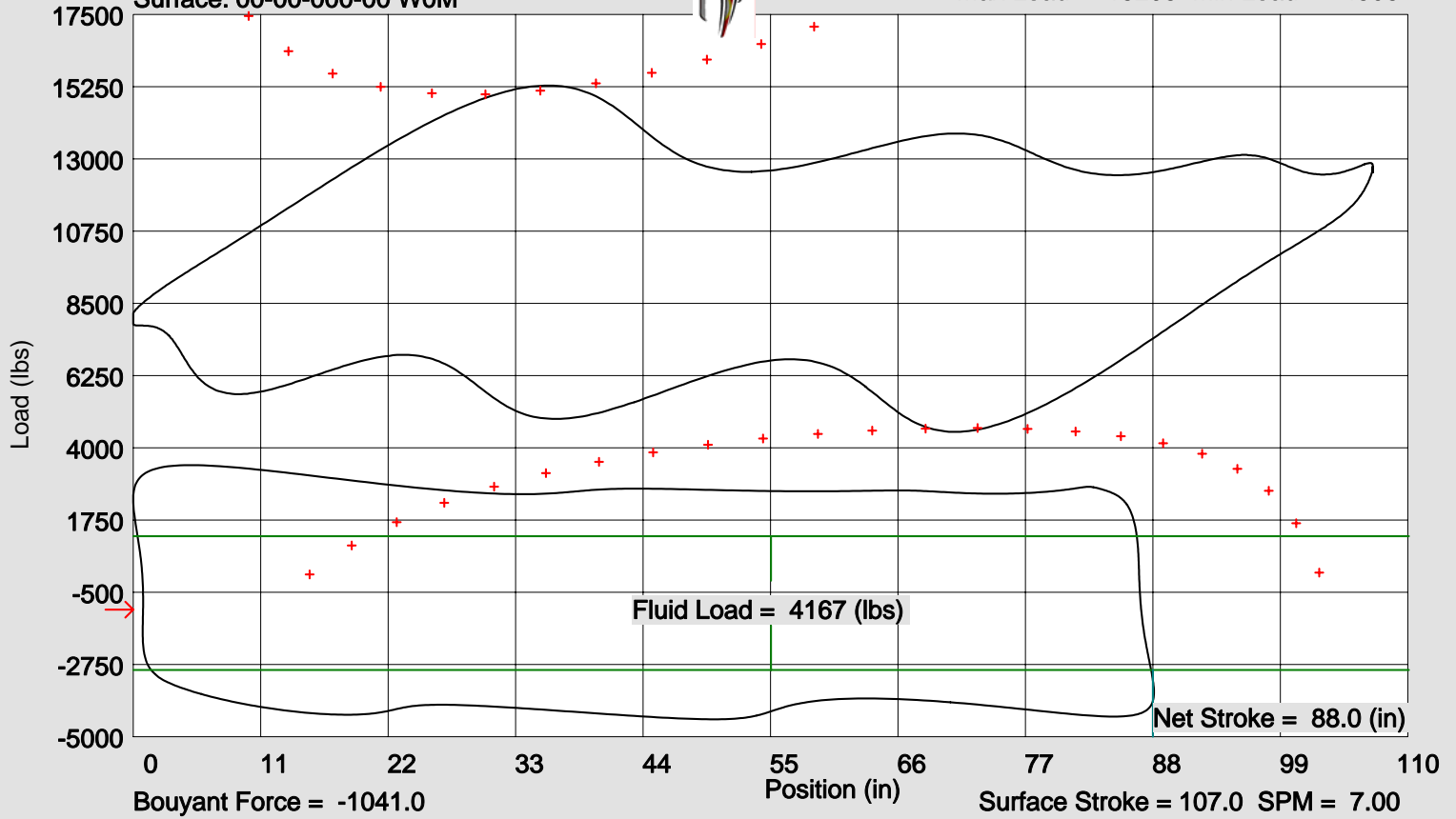


Nelgar Design Run

Downhole: 100/00-00-000-00 WOM/00
Surface: 00-00-000-00 WOM



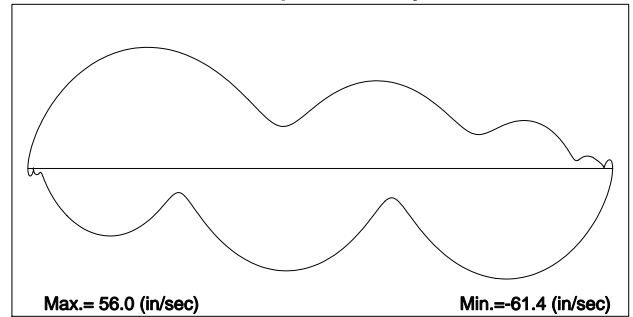
Max Load = 15295 Min Load = 4506



Rod Loading

Depth (m)	Rod Size (mm)	Loads		% Goodman Range Service Factor of		
		Max (lbs)	Min (lbs)	(1.0)	(0.9)	(0.8)
				0.00	31.8	15186.9
7.92	22.2	15168.4	4547.2	39.0	44.2	50.9
640.38	19.0	10919.8	-29.0	49.5	55.0	61.9
1707.18	19.0	3463.4	-4455.1	31.8	34.7	38.1

Pump Velocity



Pump Efficiencies

Pump Size (in): 1.75	Gross	Net
Downhole Stroke (in):	88.10	88.00
Displacement (m3/day):	35.00	34.96
Efficiency (%)	58.28	58.35

Current Production

Oil (m3/day):	2.40
Water (m3/day):	18.00
Gas (E3m3/day):	2.00

Comments

Golden Company Ltd.

Downhole: 100/00-00-000-00 WOM/00

Surface: 00-00-000-00 WOM



Nelgar Design Run

Design #5 - Norris 97 rod string @ 7.0 spm

Csg
800.00
kPa

Tbg
800.00
kPa

Elevations:
KB (m): 836.47
CF (m): 831.50

Casing:
OD (mm): 139.70
ID (mm): 122.58
Weight(kg/m): 23.10
Depth (mKB): 1735.00

Tubing:
OD (mm): 73.00
ID (mm): 62.00
Weight(kg/m): 9.67
Depth (mKB): 1705.55
Number of Jts: 179

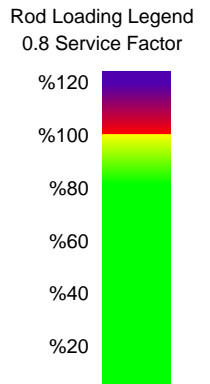
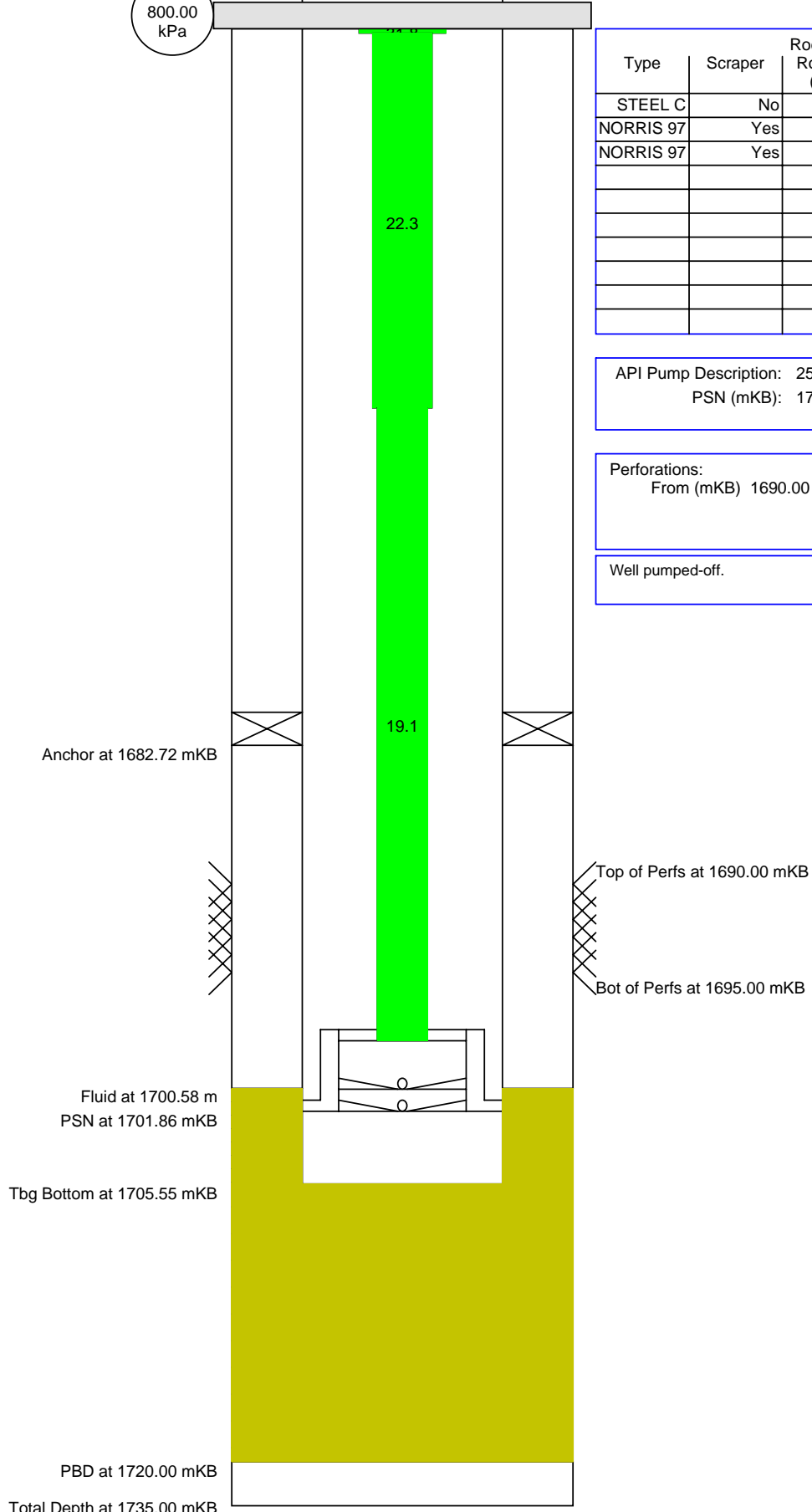
Liner:
ID (mm): 0.00
Top (mKB): 0.00
Bottom(mKB): 0.00

Type	Scraper	Rod String Rod Dia. (mm)	# Rods	Length (m)
STEEL C	No	31.80	1	7.92
NORRIS 97	Yes	22.20	83	632.46
NORRIS 97	Yes	19.10	140	1066.80

API Pump Description: 25-175 RHAC 16.0- 5.0- 4.0
PSN (mKB): 1701.86

Perforations:
From (mKB) 1690.00 to 1695.00

Well pumped-off.



Nelgar Design Run

