



AutographPC Case Report

City of Boxelder 5,6,7,10.apcx (Case 7)

General Description

Customer Name:	Unknown	Reservoir:	Unknown	Well:	Unknown
Well API#:	Unknown	Country:	USA	State:	Unknown
Engineer:	Unknown	Project Date:	11/13/2024	Print Date:	11/13/2024
Project:	City of Box Elder Well 10				
Case Number:	Case 7	Case Description:	Box Elder 10 - 400 GPM @ 1044'TDH updated 11/13/24		

Technical Design Summary

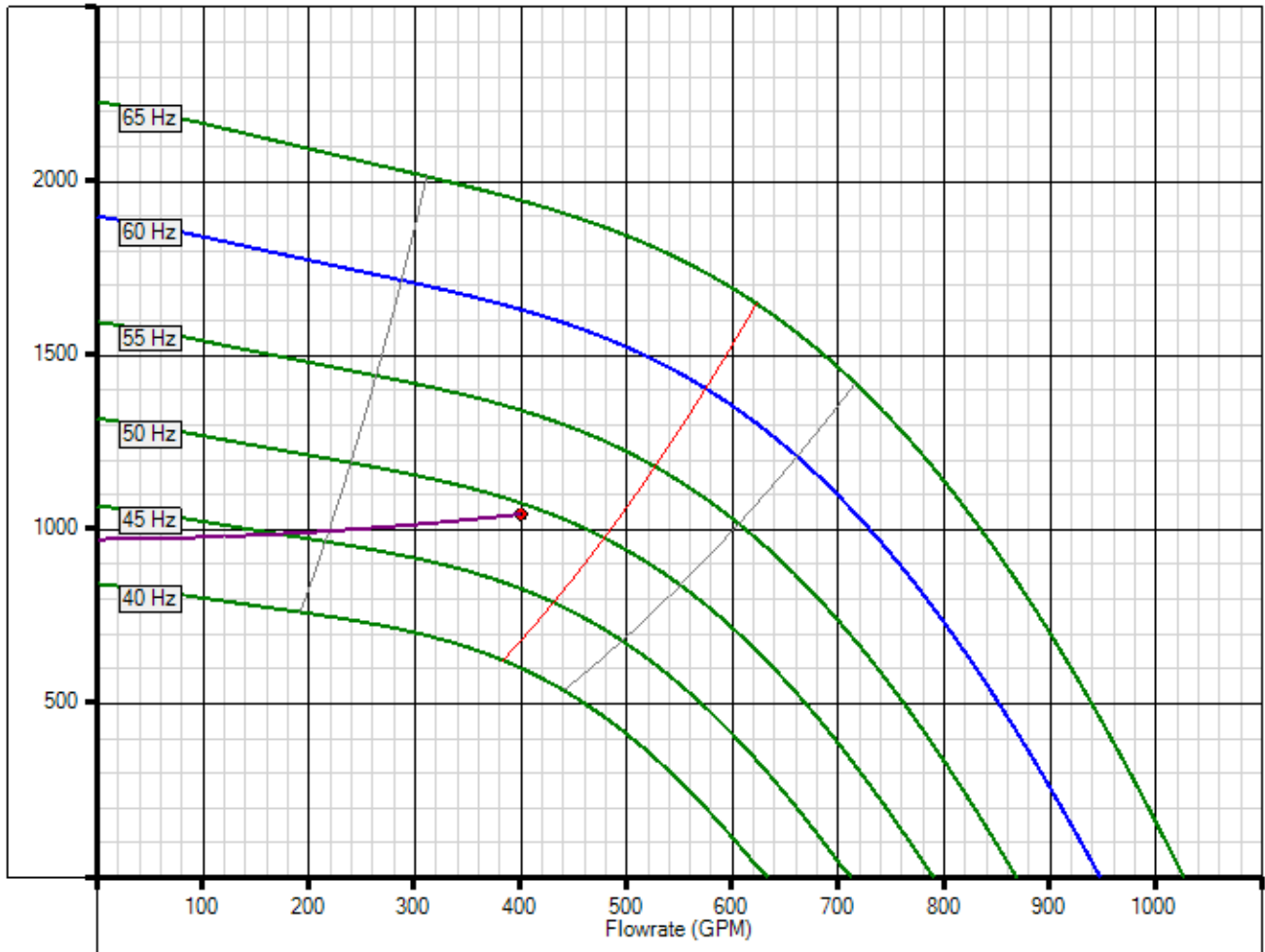
Pump:	19-675CENTRILIFT HC20000	Total Oil Produced:	0 GPM
Gas Separator:	None	Total Gas Produced:	0 Mscf/D
Seal:	513GSB3 DB	Total Water Produced:	400 GPM
Motor:	562XP_PW 250HP 2300V/ 68A (60 Hz)	Flow @ Std Conditions:	400 GPM
Surface Cable:	#4 CEER 5.0kV 50.0 ft	Pump Intake Flow:	400 GPM
Cable:	#2 CPNR 5.0kV 1520 ft	Pump Discharge Flow:	400 GPM
Motor Lead:	#4 MLE-KHT 5.0kV 30.0 ft	Pump Intake Pressure:	393 psi
Panel:	VSD 4500-VT 519kVA 480V/ 624A	MFL (Mixture):	634 ft
Sensor:	None	FLOP:	916 ft
		Free Gas Into Pump:	0 %

Pump Normal Curves

19 - 675CENTRILIFT - HC20000

19-HC20000

HEAD (ft)



Design Values

Tubing Pressure (Pt):	150 psi	Casing Pressure (Pc):	1 psi	Flow @ Std Cond (Qsc):	400 GPM
Well Flowing Pressure (Pwf):	1474 psi	Pump Intake Pressure (Pip):	393 psi	Total Dynamic Head (TDH):	1044 ft
Pump Intake VDepth:	1550 ft	Perfs Vertical Depth:	4065 ft		

Inflow performance

Inflow Model:	Straight PI	Productivity Index:	107.1 GPM/psi	Reservoir Pressure (Pr):	1478 psi
Pump Vertical Depth (Datum):	1550 ft	Static Fluid Level (Vertical):	622 ft	Test Fluid Level (Vertical):	635 ft
Test Flow Rate:	442 GPM				

Well Profile (String Description)

TVD (ft)	MD (ft)	Casing ID (in)	Tubing ID (in)
4511	4511	9.95	5.012

Fluid Data

Oil Specific Gravity:	0.85	Deg API:	35.0	Sol Gas/Oil Ratio Above Bubble Point (Rs):	0 scf/STB
Water Specific Gravity:	1.0	Water Cut:	100.0%	Fluid Surface Temperature:	108.0 °F
Producing GOR:	0 scf/STB	Producing GLR:	0 scf/STB	Bottom Hole Temperature:	115.0 °F

Gas Properties

Gas Specific Gravity:	0.65	Bubble Point Pressure:	15 psia		
N2:	0%	H2S:	0%	CO2:	0%

Gas Separation

Natural Separation Eff:	N/A	Mechanical Separation Eff:	N/A	User-entered Sep Eff:	0%
LT Gas Separator:	None	UT Gas Separator:	None	Packer Installed:	No

PVT Correlations

Bubble Point Pressure / Rs:	Standings	Oil Formation Vol Fac:	Standings
Oil Compressibility:	Kartoatmodjo	Gas Compressibility:	Hall & Yarborough

Fluid Viscosity Correlations

Dead Oil Viscosity:	Beggs & Robinson	Saturated Oil Viscosity:	Beggs & Robinson
Unsaturated Oil Viscosity:	Vasquez & Beggs	Emulsion Viscosity:	N/A

Multi-Phase Flow Correlations

Tubing Flow:	Hagedorn & Brown	Casing Flow:	Hagedorn & Brown
Roughness Factor:	0.01189 in		

LEGAL NOTICE: Because of the uncertainty of variable well conditions and the necessity of relying on facts, information and supporting services furnished by others, Baker Hughes is unable to guarantee the accuracy of any chart interpretation, research analysis, or recommendations contained herein. While best efforts should be used in gathering and interpreting such information, USERS OF THIS REPORT AGREE THAT Baker Hughes SHALL NOT BE RESPONSIBLE FOR ANY DAMAGES ARISING FROM THE USE OF THIS REPORT.

Pump Summary

675CENTRILIFT HC20000 19 Stages

BHP / RPM:	144.2 HP / 2866 RPM	Intake / Discharge Viscosity:	.57 / .57 cp
Efficiency:	72.34 %	Intake / Discharge Ch:	0.99 / 0.99
Total Dynamic Head:	1044 ft	Intake / Discharge Cq:	0.99 / 0.99
GIP:	0 %	Intake / Discharge Cbhp:	1.0 / 1.0
Intake / Discharge Pressure:	393 / 841 psi	Flow / Head / Power Adj Factor:	0.99 / 0.99 / 1.0
Intake / Discharge Flow Rate:	400.0 / 400.0 GPM	Pump Range Min/BEP/Max:	292/583/671 GPM @ 60 Hz
Intake / Discharge Spec Gravity:	.99 / .99	Pump OP Range Min/BEP/Max:	238/475/547 GPM @ 49.4 Hz
CMP = Compression, FLT = Floater, MDLR = AR Modular			
Stage Description:	675CENTRILIFT HC20000	Pump Construction:	CMP
Stage Count:	19	STD Shaft HP Limit/Op HP/Loading:	645.9 HP @ 49.4 Hz / 144.2 HP / Shaft load = (STD 22%) / (HS 14%)

Intake/Gas Separator Summary

Intake / Separator	Housing	Shaft Strength	HP	Head	Efficiency	Flow	Gas In Pump	Is AR
Intake						400 GPM	0%	N/A

Seal Section Summary

Selected:	513GSB3 DB	Shaft Load:	145 HP
Oil:	CNSF4	Shaft HP Limit:	409 HP @ 49.4 Hz
Operating Temp:	159 °F	Shaft Load %:	35%
Seal Bearing Type:	HL	Oper Thrust Bearing Load:	1385 lbf
Seal Shaft Material:	STD	Max Thrust Bearing Load:	2000 lbf
		Thrust Bearing Capacity:	5933 lbf
		Oper Thrust Loading %:	23%
		Max Thrust Loading %:	34%
		Chamber Capacity Used (Top-down):	15% 13% 11%

Motor Summary

Motor Np @60 Hz Line Freq:	562XP_PW 250HP 2300V 68A	Motor Load:	71%
Motor Np HP @Op Hz:	206 HP	Motor Op HP:	145 HP
Motor Np V @Op Hz:	1893 V	Motor Op Volt:	1744 V
Motor Np Amp:	68 A	Motor Op Amp:	52 A
Operating RPM:	2866 RPM	Motor Op Temp:	167 °F
Liquid Vel Past Mtr:	2.4 ft/s	Motor Op Pwr Factor:	78
Liquid Vel between Shrd & Csg:	N/A	Motor Op Eff:	89%
Sensor:	None	Motor Op Freq:	49.4 Hz
Pot Head:	CentrLink 20	Motor KVA:	157

Motor Section Details

Motor @ Op Freq 49.4Hz:	562XP_PW 145HP 1744V 52A 167°F	Shaft Op / Limit / %Load:	145 HP / 778 HP @49.4 Hz / 19%
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Controller Summary

Panel:	VSD	Output Current:	225 A
Input kVA:	164	Output Voltage:	417 V
Cost \$/KWH:	0.05		

Motor Lead Cable Summary

Selected MLE:	#4 MLE-KHT 5.0kV 30.0 ft		
Wire Size:	#4	Armor:	Monel
Dimension:	0.437 in x 1.161 in	Motor Lead Clearance (Dia.):	2.573 in

Power Cable Summary

Selected Cable:	#2 CPNR 5.0kV		
Cable Length:	1520 ft	Cable Voltage Loss:	26 V
Cable Amps:	52 A	Cable Power Loss:	2 KW
Cable Voltage Loss / kft:	17 V/kft	Cable Conductor Temp:	133 °F
		Cable Clearance (Dia.):	2.497 in

Surface Cable Summary

Selected Cable:	#4 CEER 5.0kV		
Cable Length:	50.0 ft	Total Voltage Loss:	1 V
Cable Amps:	52 A	Cable Power Loss:	0.119 KW
Cable Voltage Loss / Kft:	27 V/kft	Cable Conductor Temp:	133 °F

Disclaimer: Baker Hughes Artificial Lift cables are manufactured for downhole ESP applications. The cables are not rated for surface use. The reference to surface cables in APC is solely used to calculate voltage drop for equipment sizing purposes. No cable provided by Baker Hughes Artificial Lift should be used for any surface application. Follow local regulatory requirements when selecting surface cables for application.

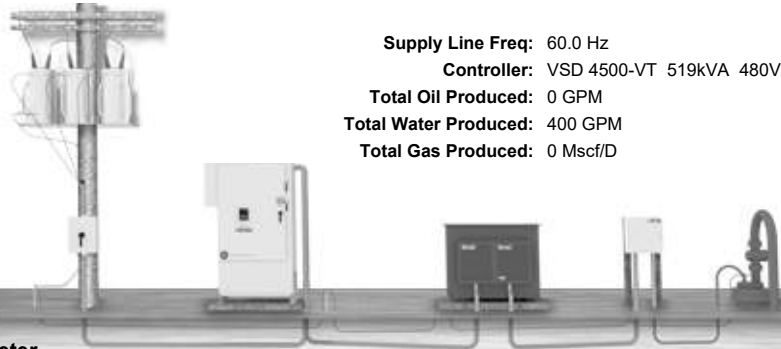
Total Electrical Parameters for Power Cable and Surface

Total Surface Voltage:	1773 V	System Power Cost / Month:	4611 \$/mo
Total Voltage Loss:	28 V	Cable Power Cost / Month:	90 \$/mo
Total Voltage Loss / kft:	18 V/kft	Power Cost:	0.05 \$/KWH
Total Cable Length:	1600 ft	Cable Power Loss:	3 KW
Surface KVA:	159 KVA	Surface KW:	125 KW

Equipment Layout

Amperage: 51.85 A
Surface KVA: 159.2 KVA
Surface Volt: 1773 V
Surface Cable: #4 CEER 5.0kV 50.0 ft
Power Cable: #2 CPNR 5.0kV 1520 ft
Tbg Pressure: 150.0 psi
Qg Up Tubing: 0 Mscf/D
Csg Pressure: 1.0 psi
Qg Up Casing: 0 Mscf/D

Supply Line Freq: 60.0 Hz
Controller: VSD 4500-VT 519kVA 480V/ 624A
Total Oil Produced: 0 GPM
Total Water Produced: 400 GPM
Total Gas Produced: 0 Mscf/D



Measured Depth (ft)	Outside Diameter (in)	Inside Diameter (in)	Length (ft)	Description	
1550 ft	5.512 in	5.012 in	1550 ft	Tubing	←
				Discharge	←
N/A	6.75 in		0 ft	Pump CENTRILIFT HC20000 Stages 19 144.2 HP	←
N/A	0 in		0 ft	Intake	←
N/A	5.13 in		0 ft	Seal 513GSB3 DB	←
N/A	5.62 in		16.8 ft	Motor 562XP_PW Nameplate: 250HP 2300V 68A(60Hz) Motor ADR: 219HP 2228V 61A(60Hz) Oper Temp: 166.7°F	←
N/A	5.62 in		N/A	Motor Base	←
Total MD:	N/A				
				Top of Prod Interval: 4065 ft	←
				Reservoir Pressure: 1478 psi	
				Design Inflow (Pwf): 1474 psi	



Motor Lead:
 #4 MLE-KHT
 5.0kV 30.0 ft

Disclaimer: The schematic represents a standard ESP string.
 All the dimensions are limited to the data available for the BH
 and GE equipment.

Field Service Information

Well Information

Customer Name:	Unknown
Well:	Unknown

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Controller Setup

Motor ADR @ 60 Hz:	219HP 2228V 61A (Use this rating for doing calculations when setting up controller)
Min Hz:	46
Max Hz:	54 (Max Hz is where target production is expected but actual setup should be higher based on operation expectations)
User Comments:	

Sensitivity Analysis

Freq (Hz)	Flow (GPM)	NPSHr (ft)	Pip (psi)	Gip (%)	MtrLoad (%)	MtrV (V)	MtrA (A)	SurfV (V)	MtrTemp (°F)
46	254.3	35.35	395.4	0	52.52	1524	41.51	1546	155.3
48	348.3	37.18	394.1	0	64.16	1660	48.21	1686	162.1
50	420.9	39.09	393.0	0	73.14	1781	53.29	1810	168.8
52	480.2	41.08	392.0	0	80.71	1895	57.52	1926	175.4
*54	531.6	43.14	391.1	0	87.62	2005	61.34	2039	182.2
56	578.0	45.27	390.3	0	94.19	2115	64.93	2151	189.3