Introduction

STIPumpCard™ is powerful and user-friendly software for simulating dynamic behaviors of pump jacks. It is capable of predicting the behavior of a wide range of wells.

STIPumpCard can simulate both vertical and deviated wells, it is also capable of estimating pump loading based on surface loading.

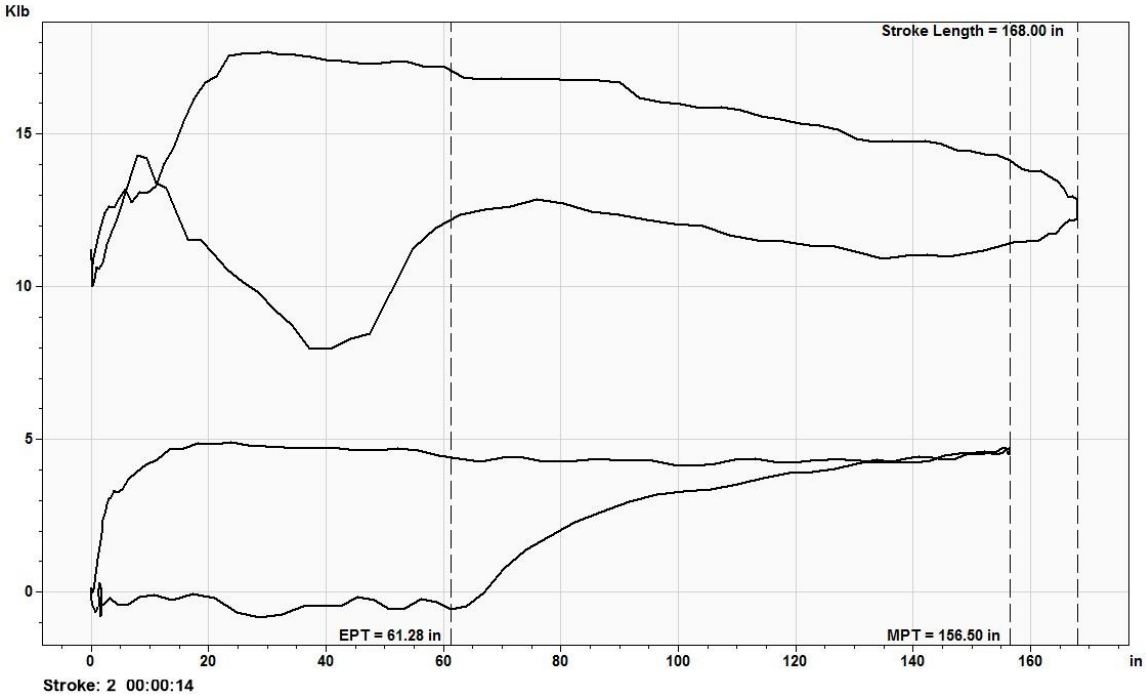
STIPumpCard produces a number of plots, including Dynamometer Cards, Fatigue Life predictions, Compressive Load distribution, Speed Reducer Torque and Rod Side Forces. STIPumpCard also predicts other parameters such as the minimum required Motor Power and required speed reducer torque rating. Additionally, STIPumpCard is capable of predicting a wide range of phenomena such as fluid pound, gas interference and gas locking.

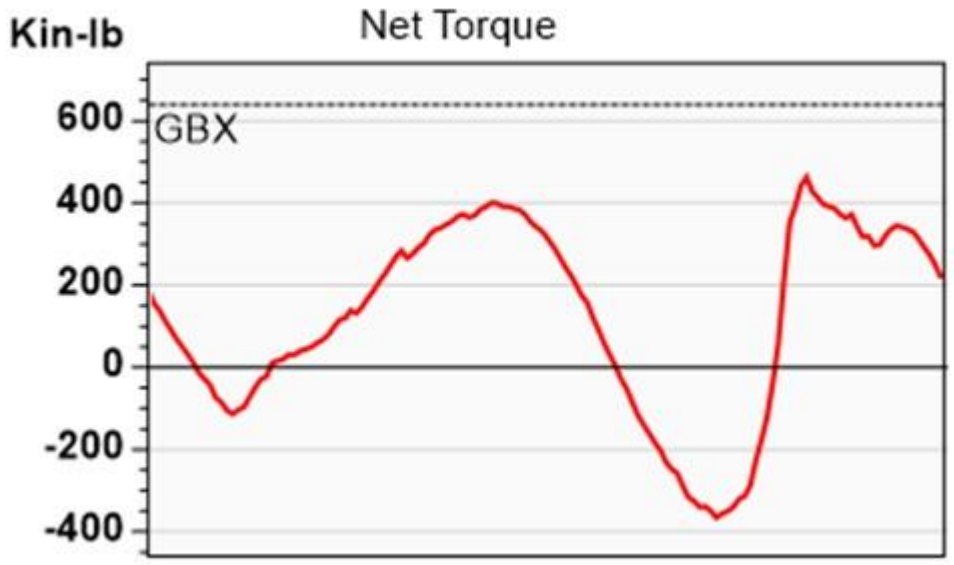
STIPumpCard also allows the user to specify different upstroke/downstroke stroke rates (SPM) as well as different upstroke/down stroke damping factors, for more accurate predictions.

The user can save input information and load the project later or pass it on to another user. After each simulation, the input and simulated output data and figures are automatically stored in a project folder.

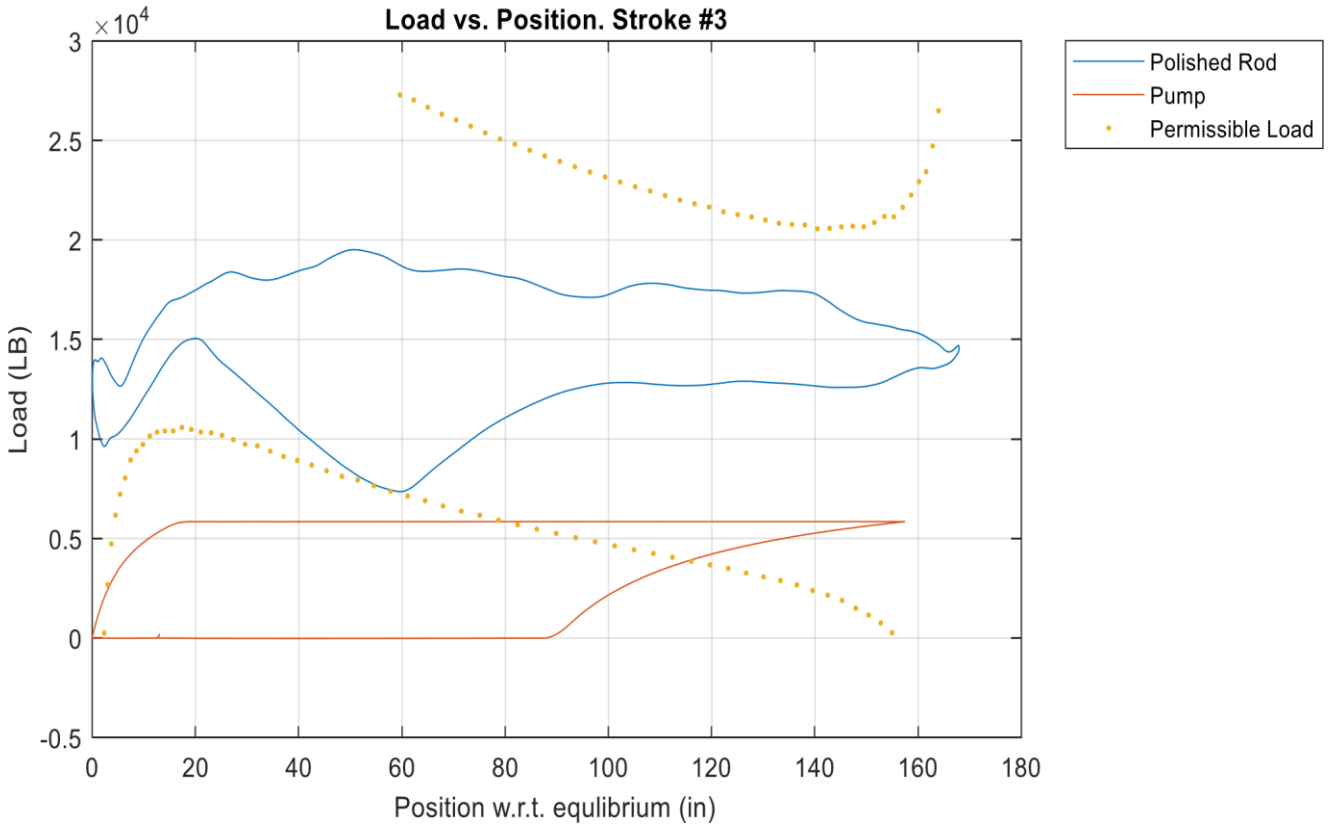
Real Well Verification

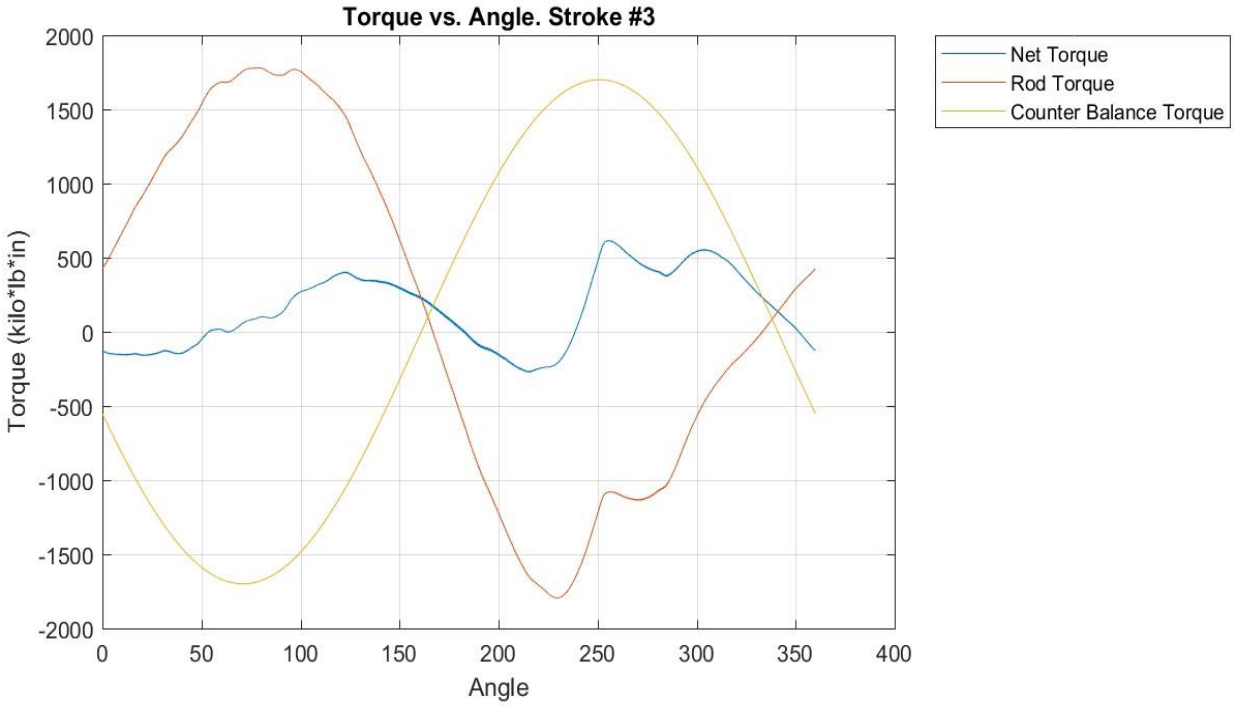
Real well data: Gas Compression



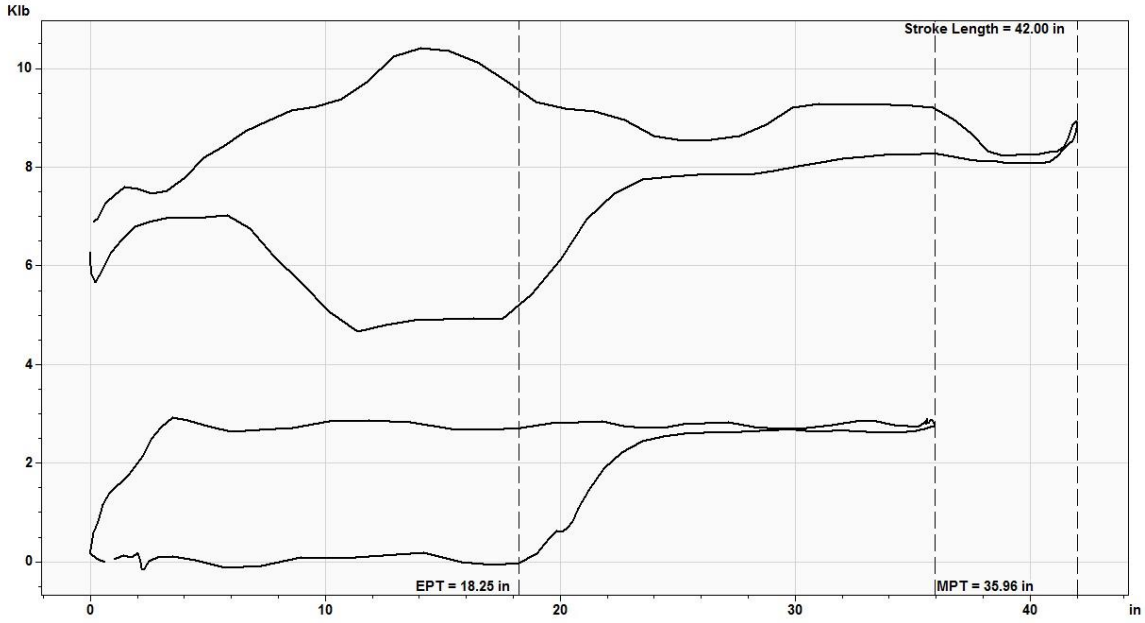


STIPumpCard Simulation:

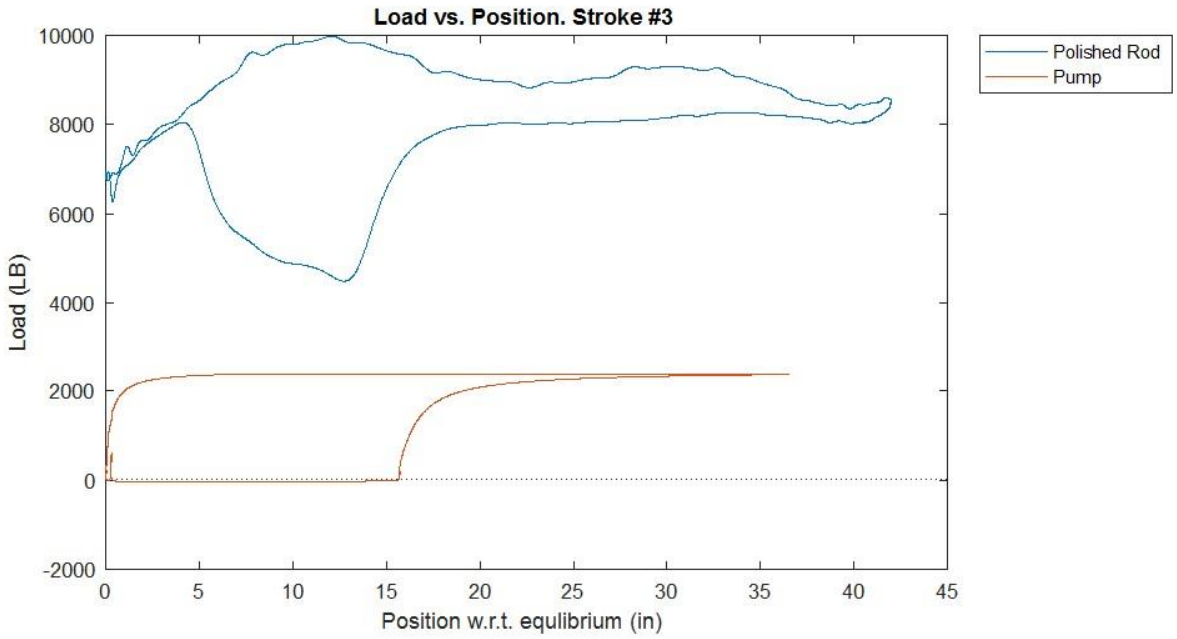




Real Well data: Fluid Pound



STIPumpCard Simulation:



STIPumpCard outputs the fatigue loading as well as rod tensile loads.

Figure below shows the maximum and minimum tensile load on the rod:

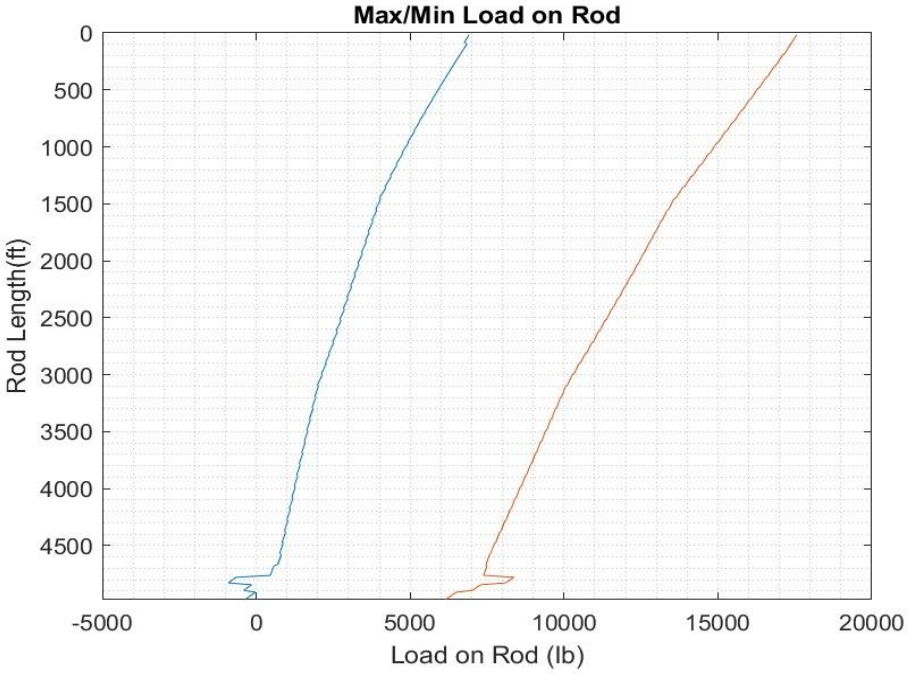
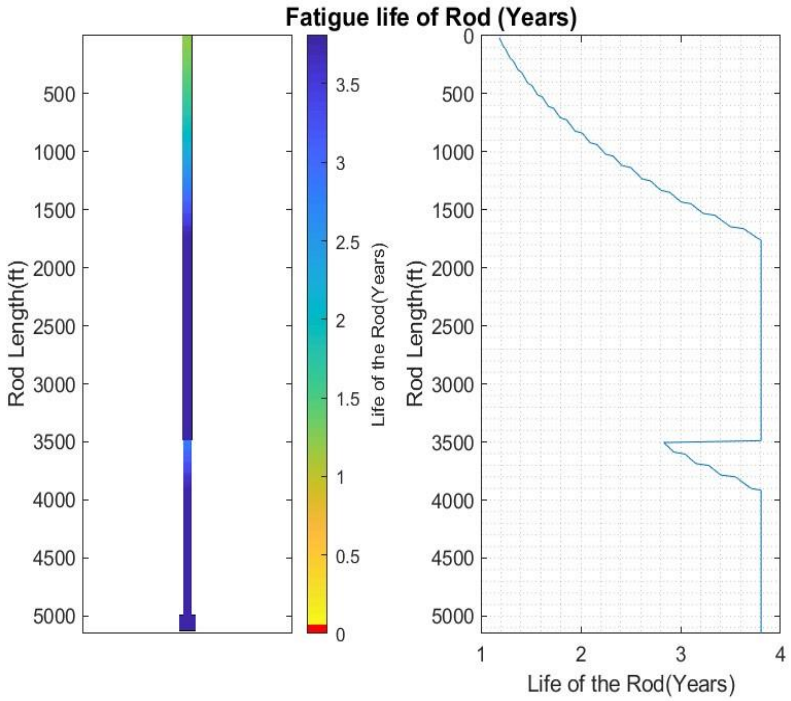


Figure below shows the expected Fatigue life

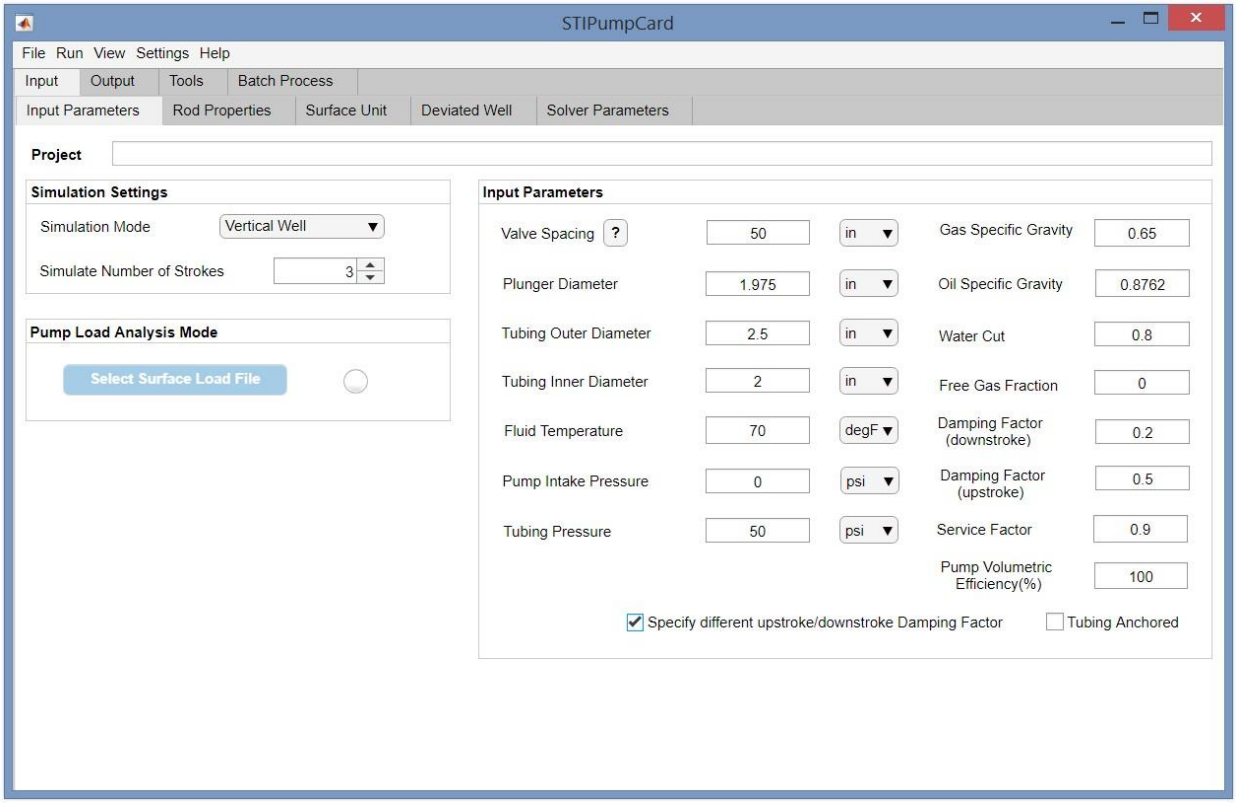


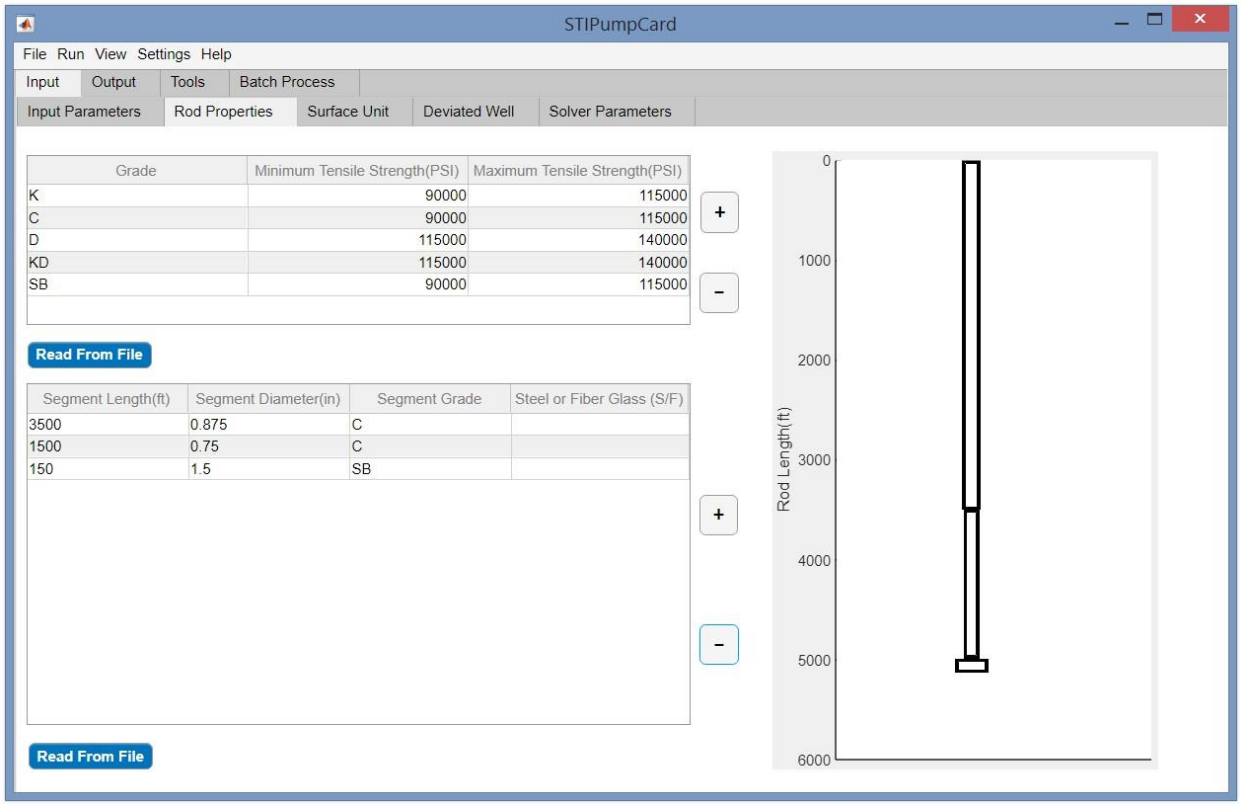
STIPumpCard outputs a summary of input and numerical values for all plots in separate worksheets of an Excel workbook.

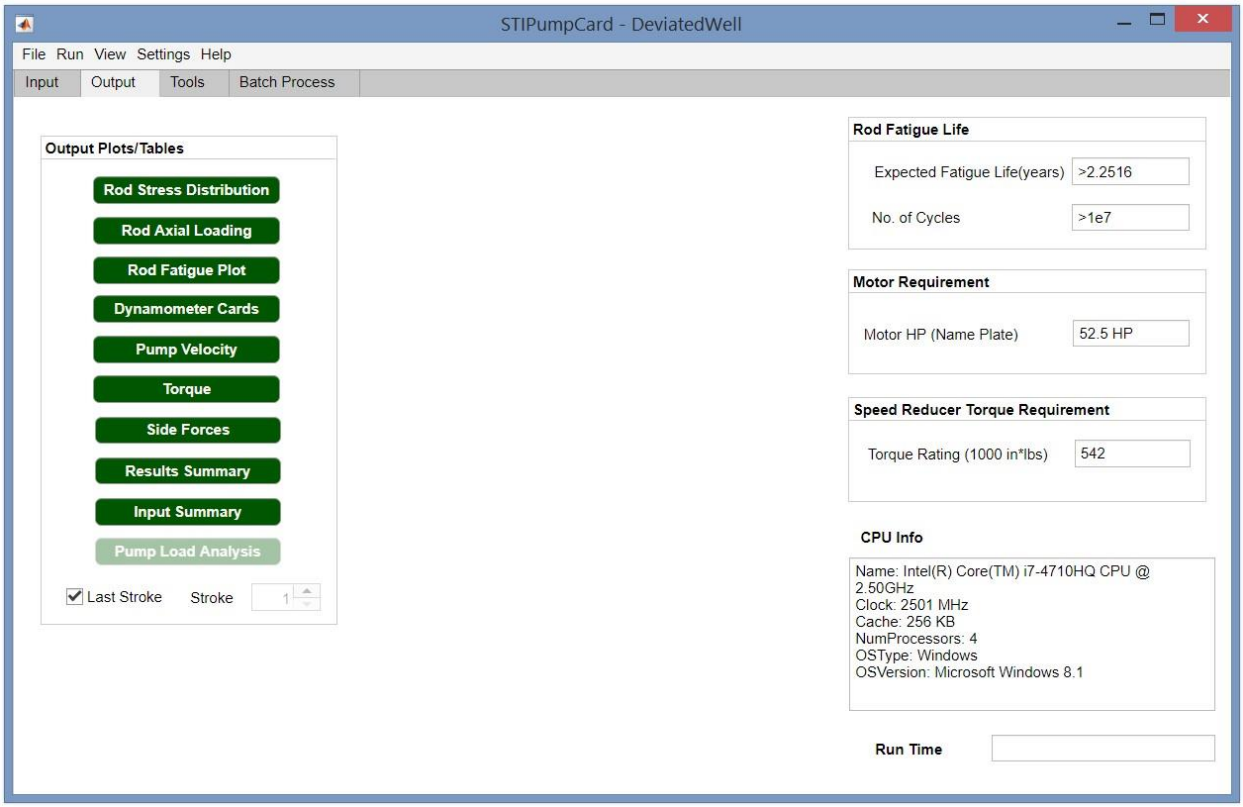
Input Summary:					
Rod Segment Length	2840 ft, 160 ft	Rod Diameter	1 in, 1.625 in	Plunger Diameter	3.25 in
Pump Stroke Rate	5 SPM	Surface Stroke Length	240.1032 in	Anchored	No
Tubing OD	3.5 in	Tubing ID	2.992 in	Tubing Length	3000 ft
Damping Factor	0.1	Fluid Temperature	21.1111 deg C	Valve Spacing	3.5 in
Tubing Pressure	100 PSI	Pump Intake Pressure	108.0546 PSI	Fluid Specific Gravity	0.99808
Gas Specific Gravity	0.65	Free Gas Fraction	0	Water Cut	0.98
Unit Information:	Conventional				
A	228 in	C	120.03 in	I	120 in
K	258.5363 in	P	226.8 in	R	60 in
S	N/A	M	N/A	SU	-2855 lb
Pmin	N/A	Pmax	N/A	Tau	N/A
Max Moment	0 in*lb	Efficiency	70%	Rotation	CCW
Result Summary:					
PPRL	22471.4442 lb	MPRL	3966.0957 lb	Fo	10587.2988 lb
Pump Stroke Length	225.6695 in	Static Stretch	15.5396 in		
Fo/SKr	0.064072	Kr	688.2114 lb/in	Kt	2129.7141 lb/in
Production Detail:					
Fluid	1358.7099 BBL/D	Gas	0 BBL/D	Gas Lock	No
Equipment Requirement					
Motor Name Plate	65 HP	Speed Reducer Torque	2773 kilo*in*lb	Expected Fatigue Life	3.1371 years

User Interface:

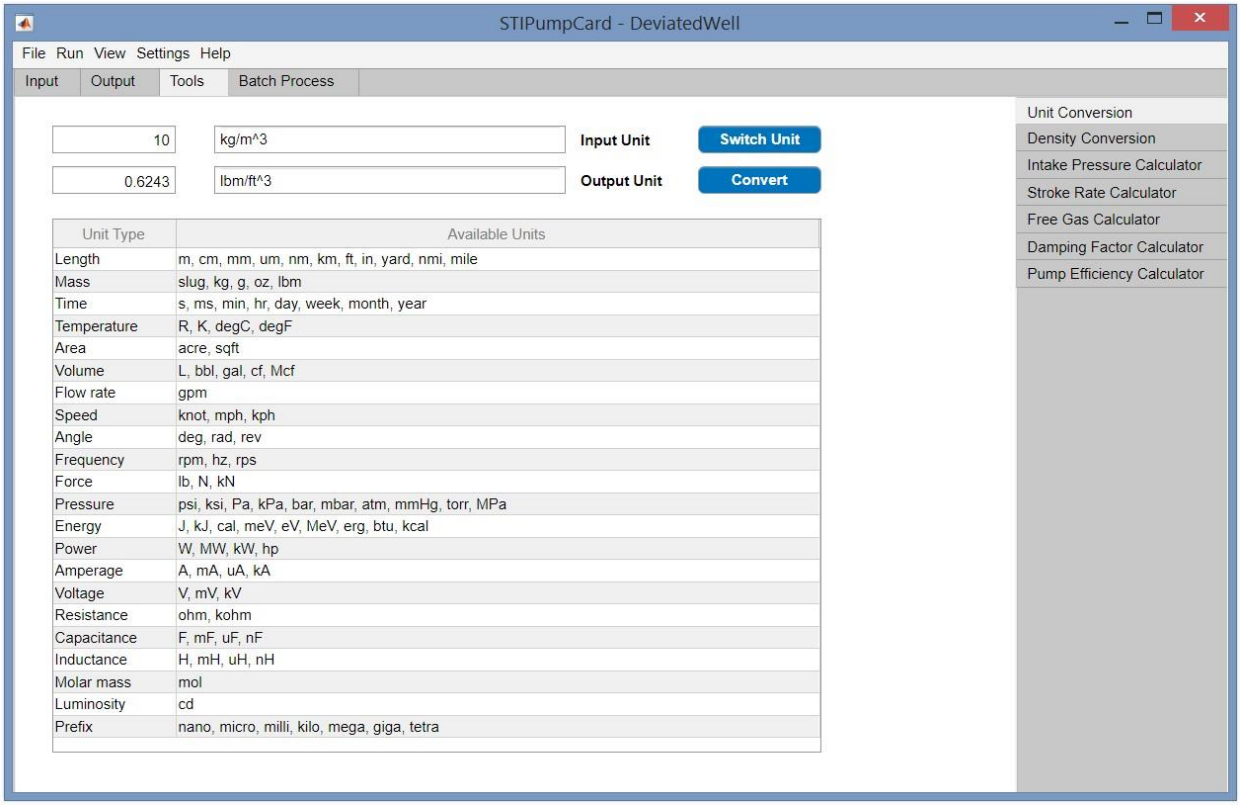
Input data, including borehole survey, is input via a user-friendly interface:


STIPumpCard
File Run View Settings Help
Input Output Tools Batch Process
Input Parameters Rod Properties Surface Unit Deviated Well Solver Parameters
Project
Simulation Settings
Simulation Mode
Vertical Well
Simulate Number of Strokes
3
Pump Load Analysis Mode
Select Surface Load File
Input Parameters
Valve Spacing
?
50
in
Plunger Diameter
1.975
in
Tubing Outer Diameter
2.5
in
Tubing Inner Diameter
2
in
Fluid Temperature
70
degF
Pump Intake Pressure
0
psi
Tubing Pressure
50
psi
Gas Specific Gravity
0.65
Oil Specific Gravity
0.8762
Water Cut
0.8
Free Gas Fraction
0
Damping Factor (downstroke)
0.2
Damping Factor (upstroke)
0.5
Service Factor
0.9
Pump Volumetric Efficiency(%)
100
Specify different upstroke/downstroke Damping Factor
Tubing Anchored


STIPumpCard
File Run View Settings Help
Input Output Tools Batch Process
Input Parameters Rod Properties Surface Unit Deviated Well Solver Parameters
Grade
Minimum Tensile Strength(PSI)
Maximum Tensile Strength(PSI)
K 90000 115000
C 90000 115000
D 115000 140000
KD 115000 140000
SB 90000 115000
Read From File
Segment Length(ft)
Segment Diameter(in)
Segment Grade
Steel or Fiber Glass (S/F)
3500 0.875 C
1500 0.75 C
150 1.5 SB
Read From File
Rod Length(ft)
0
1000
2000
3000
4000
5000
6000



STIPumpCard contains tools, including: unit conversion, pump intake pressure estimator (from IPR curve or fluid level), stroke rate estimator from production rate, free-gas estimator (amount of free gas at intake based on gas separator used), damping factor estimator, pump efficiency and slippage calculator.



Unit Type	Available Units
Length	m, cm, mm, um, nm, km, ft, in, yard, nmi, mile
Mass	slug, kg, g, oz, lbm
Time	s, ms, min, hr, day, week, month, year
Temperature	R, K, degC, degF
Area	acre, sqft
Volume	L, bbl, gal, cf, Mcf
Flow rate	gpm
Speed	knot, mph, kph
Angle	deg, rad, rev
Frequency	rpm, hz, rps
Force	lb, N, kN
Pressure	psi, ksi, Pa, kPa, bar, mbar, atm, mmHg, torr, MPa
Energy	J, kJ, cal, meV, eV, MeV, erg, btu, kcal
Power	W, MW, kW, hp
Amperage	A, mA, uA, kA
Voltage	V, mV, kV
Resistance	ohm, kohm
Capacitance	F, mF, uF, nF
Inductance	H, mH, uH, nH
Molar mass	mol
Luminosity	cd
Prefix	nano, micro, milli, kilo, mega, giga, tetra

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