ICoTA Canada Round Table Oct 21, 2015

Connecting pre-job Engineering and Realtime Data to improve CT operations

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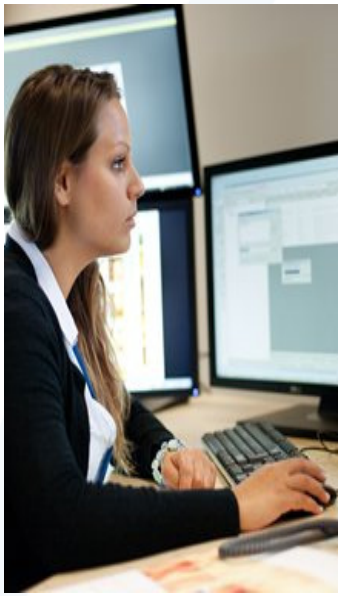
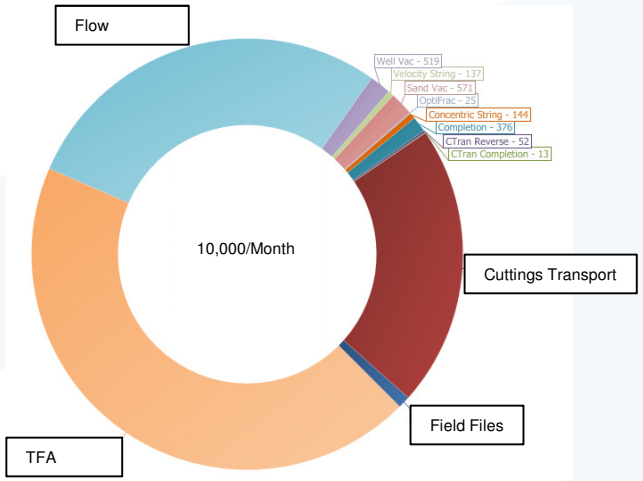
Overview

- Why did we do this?
- Field Implementation of the current solution
- Where are we heading

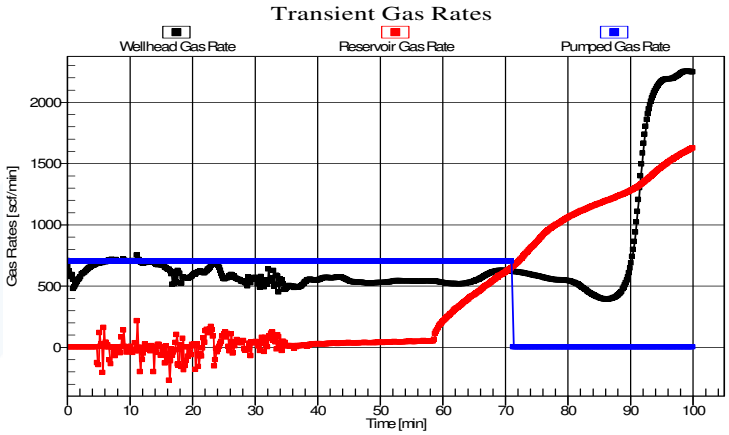
Engineering

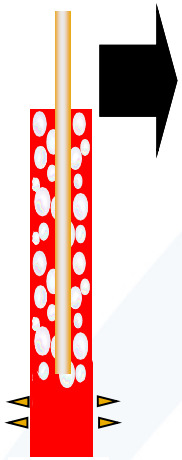


For 30 years software simulations have helped plan efficient CT operations.

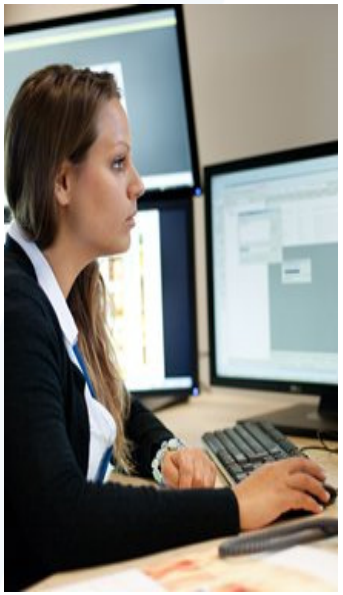


6 years ago transient simulations were added to augment steady state simulations





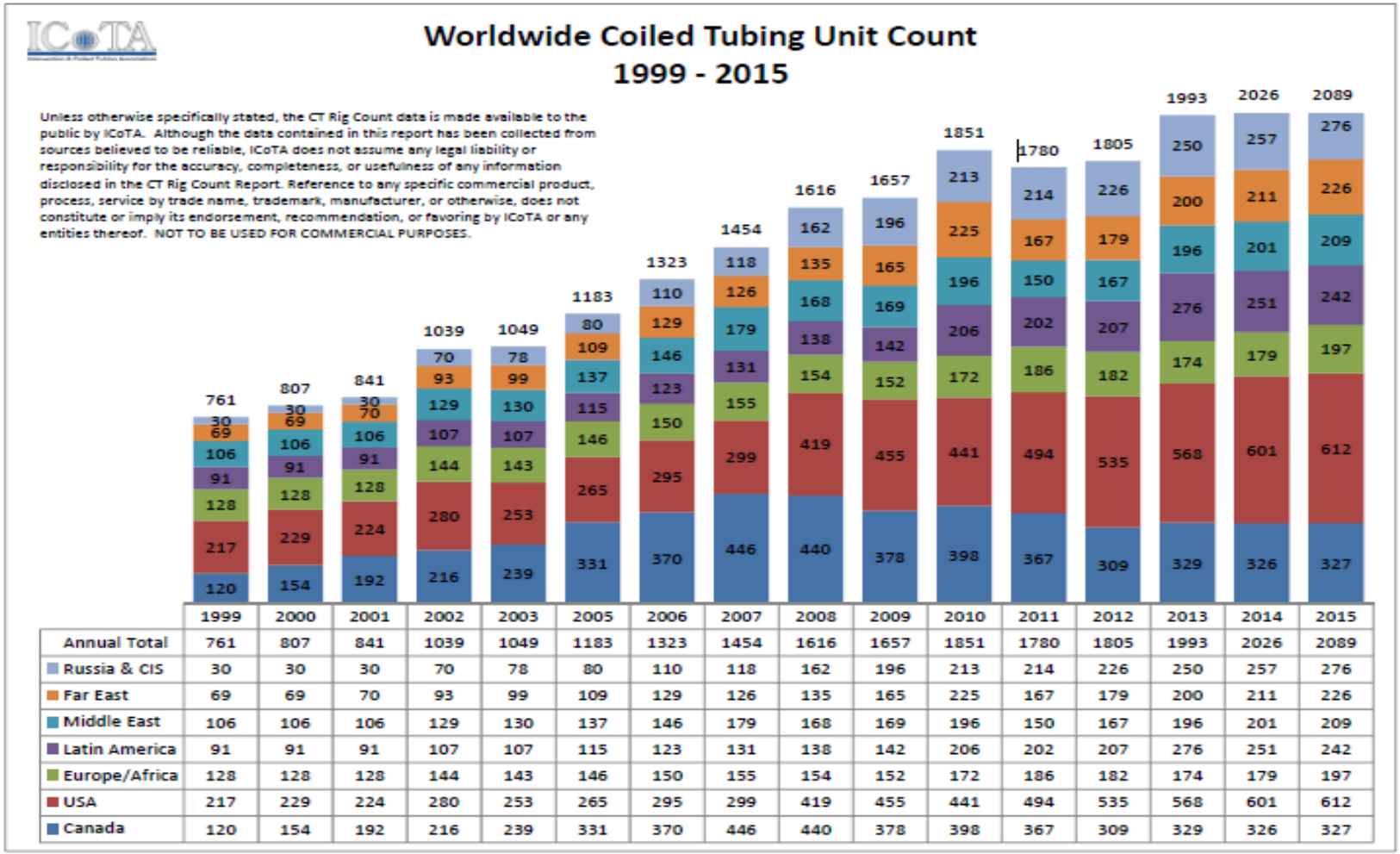
Engineering



Work over Program

You can’t plan for what you don’t know

Supervisor Experience:

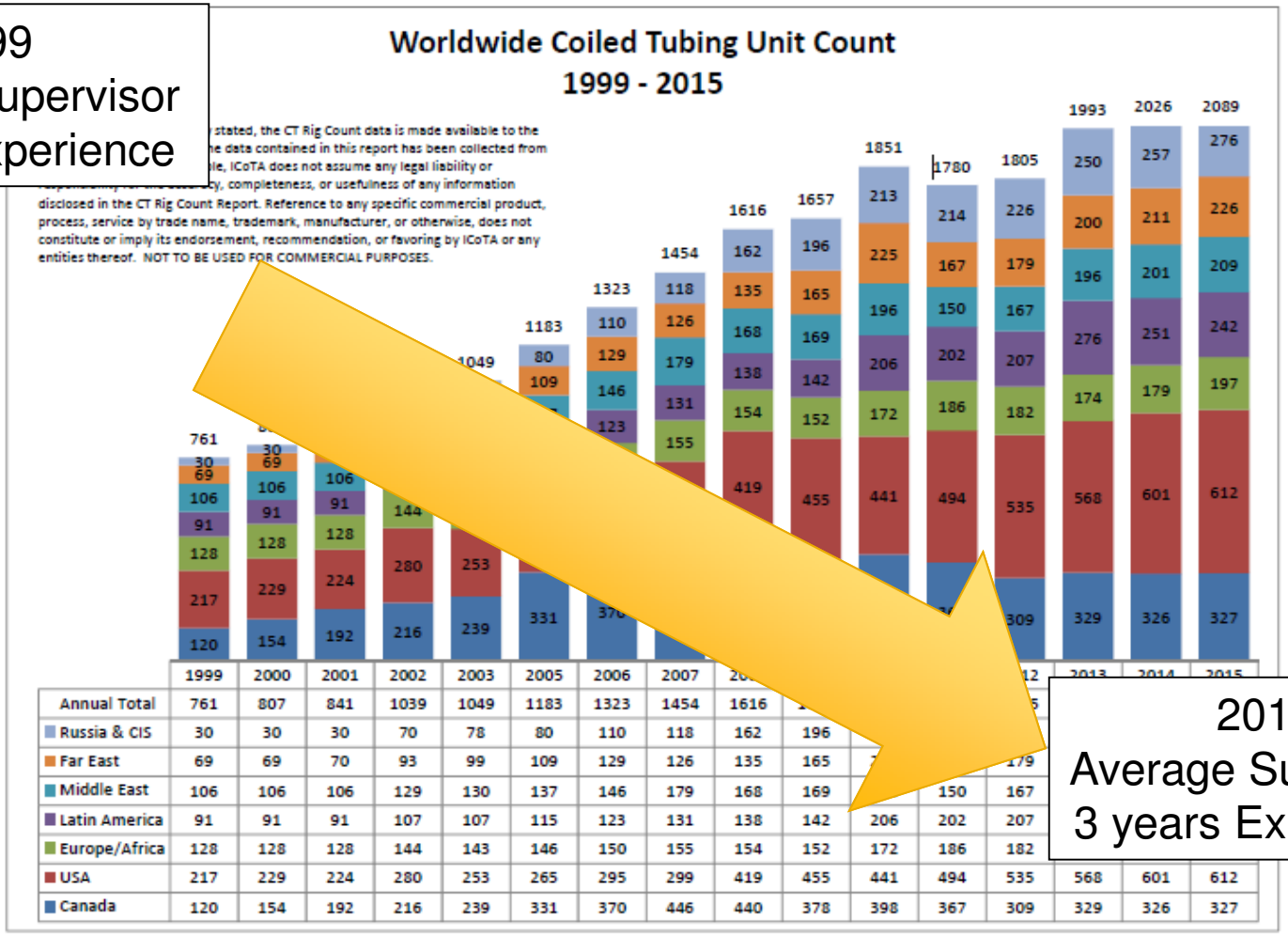


	1999	2000	2001	2002	2003	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Annual Total	761	807	841	1039	1049	1183	1323	1454	1616	1657	1851	1780	1805	1993	2026	2089
Russia & CIS	30	30	30	70	78	80	110	118	162	196	213	214	226	250	257	276
Far East	69	69	70	93	99	109	129	126	135	165	225	167	179	200	211	226
Middle East	106	106	106	129	130	137	146	179	168	169	196	150	167	196	201	209
Latin America	91	91	91	107	107	115	123	131	138	142	206	202	207	276	251	242
Europe/Africa	128	128	128	144	143	146	150	155	154	152	172	186	182	174	179	197
USA	217	229	224	280	253	265	295	299	419	455	441	494	535	568	601	612
Canada	120	154	192	216	239	331	370	446	440	378	398	367	309	329	326	327

275% increase in units

Supervisor Experience:

1999
Average Supervisor
8 years Experience



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Middle East	106	106	106	129	130	137	146	179	168	169	196	150	167	196	201	209
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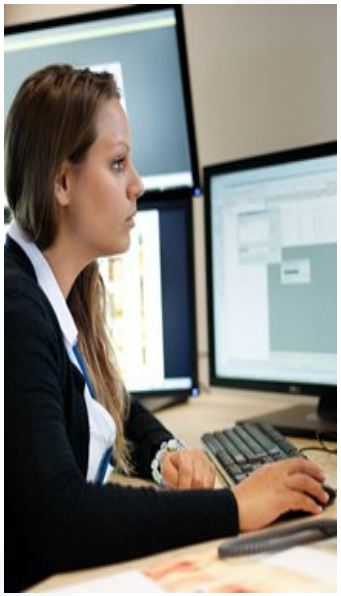
Canada	120	154	192	216	239	331	370	446	440	378	398	367	309	329	326	327

2015
Average Supervisor
3 years Experience

275% increase in units

How can we help?



Engineering supplies file with intervention design to the field computer

Data Acquisition calls engineering models every second

Field-accessible modeling, real-time feedback, and system alerts. Combined with well-trained crews will dramatically reduce operational setbacks

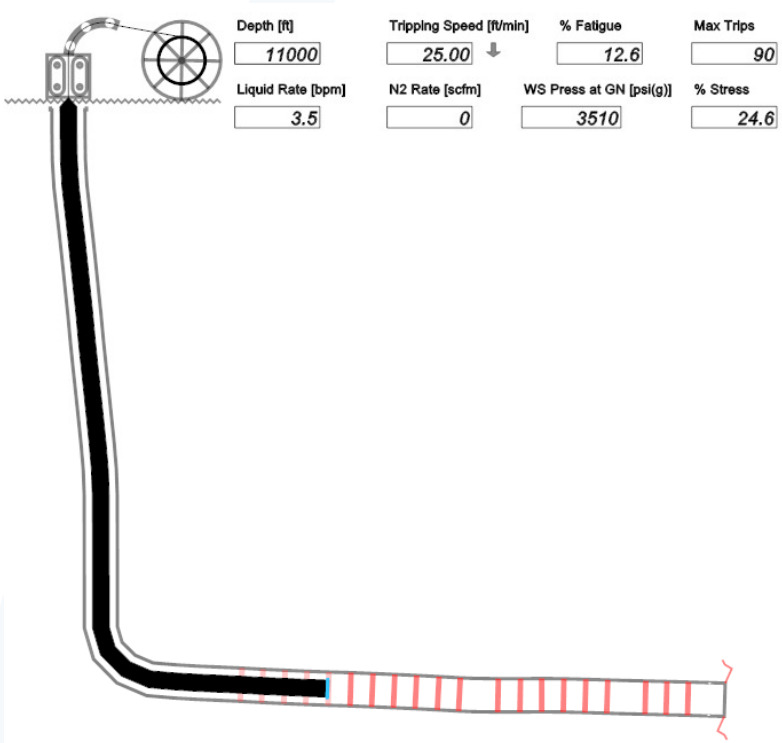
What can be provided?

- Provide a realistic well view showing CT position & well features
- Continuously monitor the state and trends of critical parameters to flag opportunities and issues
- Provide help and suggestions for issues/opportunities flagged

- Update WG/Pressure limits for current conditions
- Calculate and display CT fatigue state on the fly
- Update Injector motor and traction pressure limits

- Display time & Distance to the next well feature.
- Display MD, TVD and deviation at the BHA.

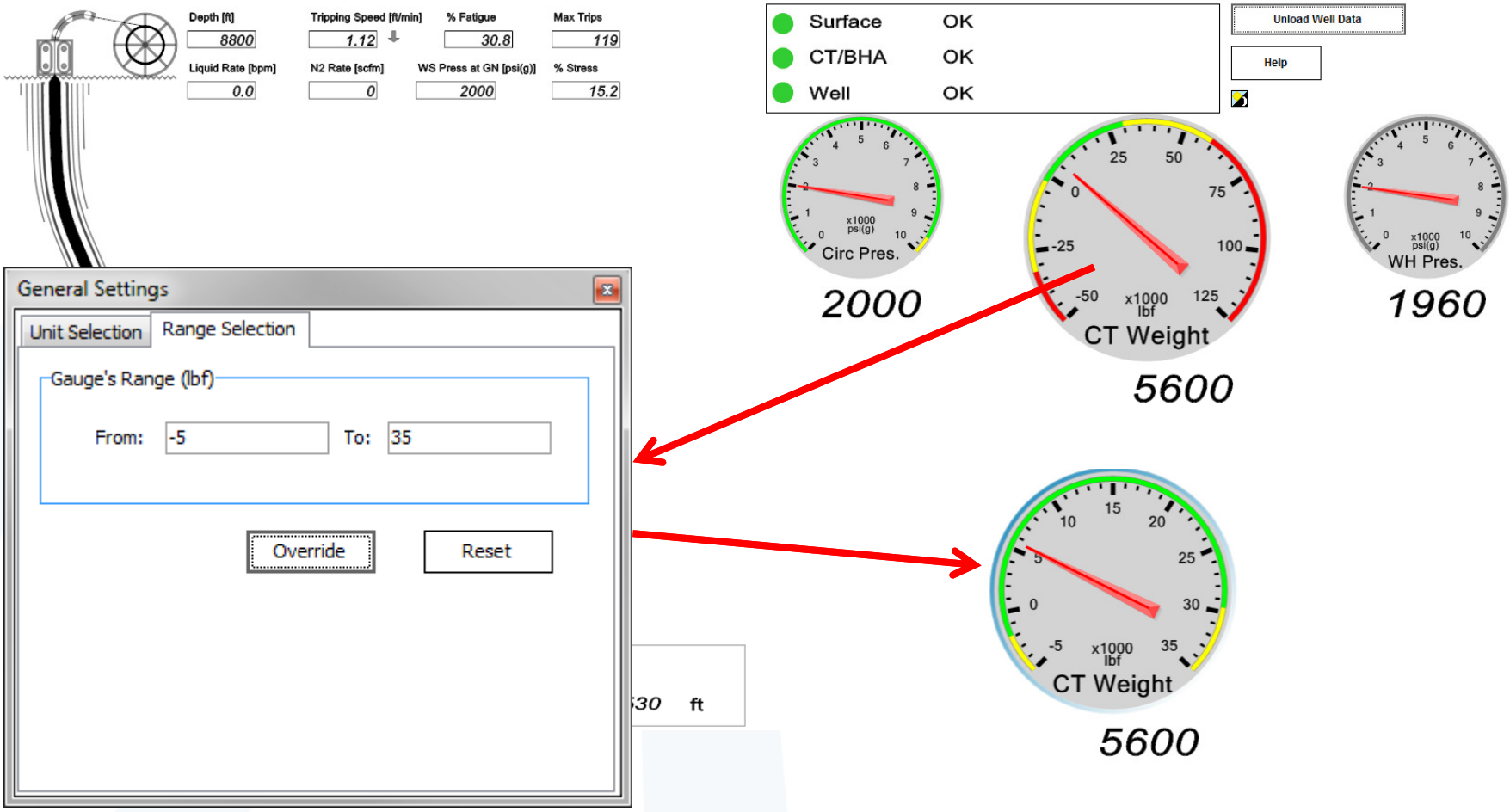
Field Display: Weight Gauge



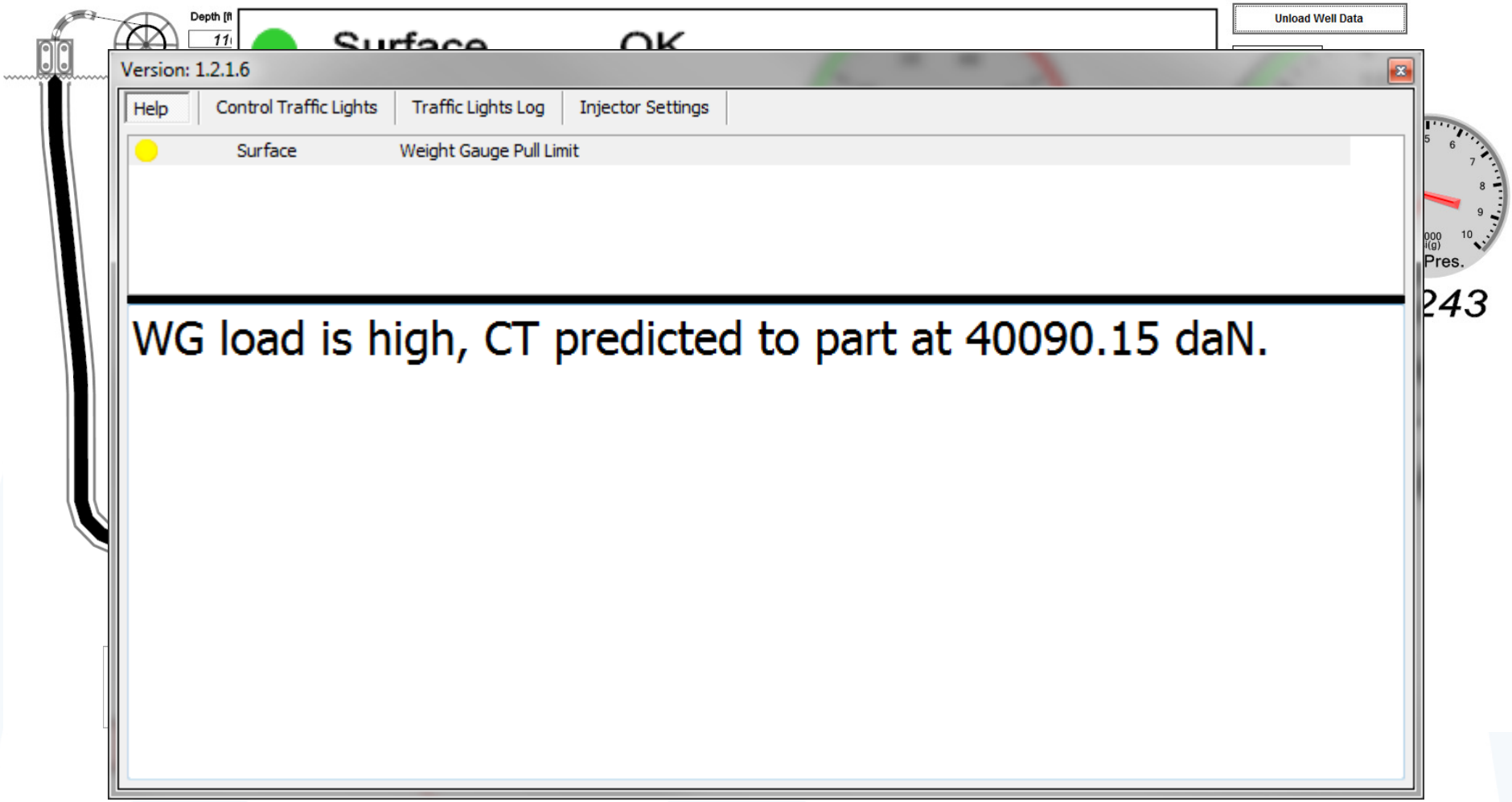
BHA: MD(ft) 11000.0 TVD(ft) 8218.1 DEV(deg) 88.3

From BHA to Plug (ID=0.00 in)				
Time(hh:mm:ss)	00:12:24	Distance	310	ft

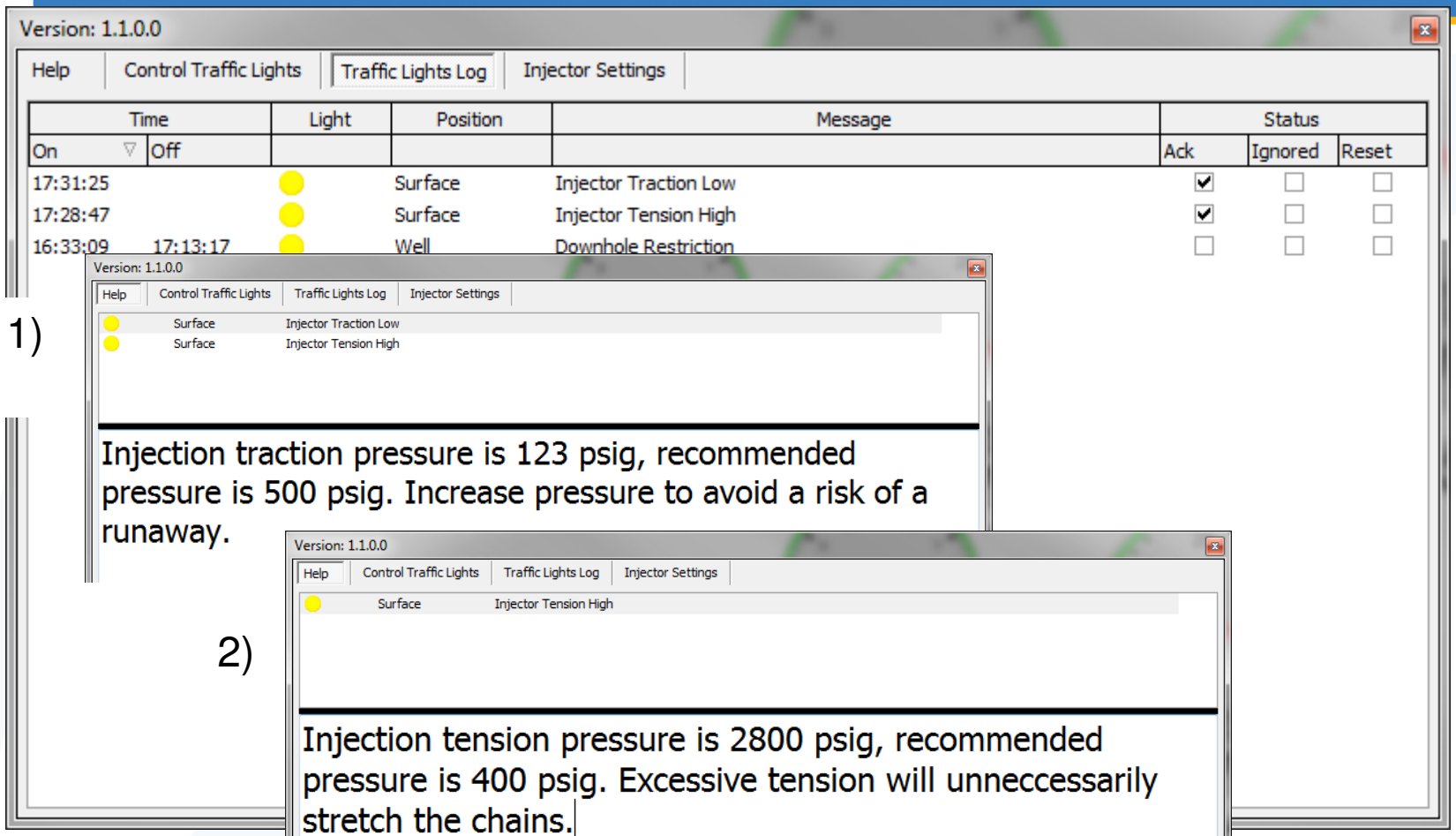
Weight Gauge Zoom Feature



Field Display: Traffic Lights



Traffic Lights: Examples



1)

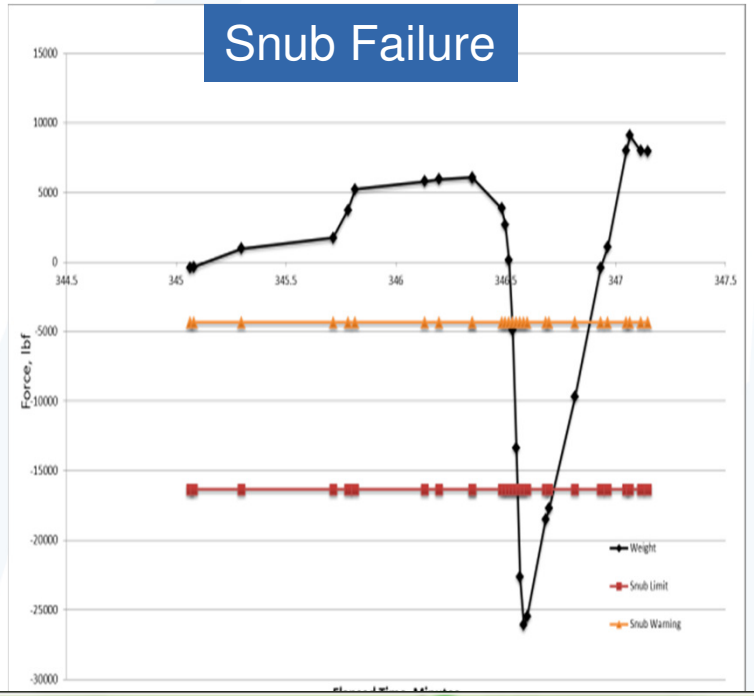
2)

3) BHA Shear Pin/Burst Disks limits

4) 39 and counting…..

Weight Gauge Warnings

Snub Failure

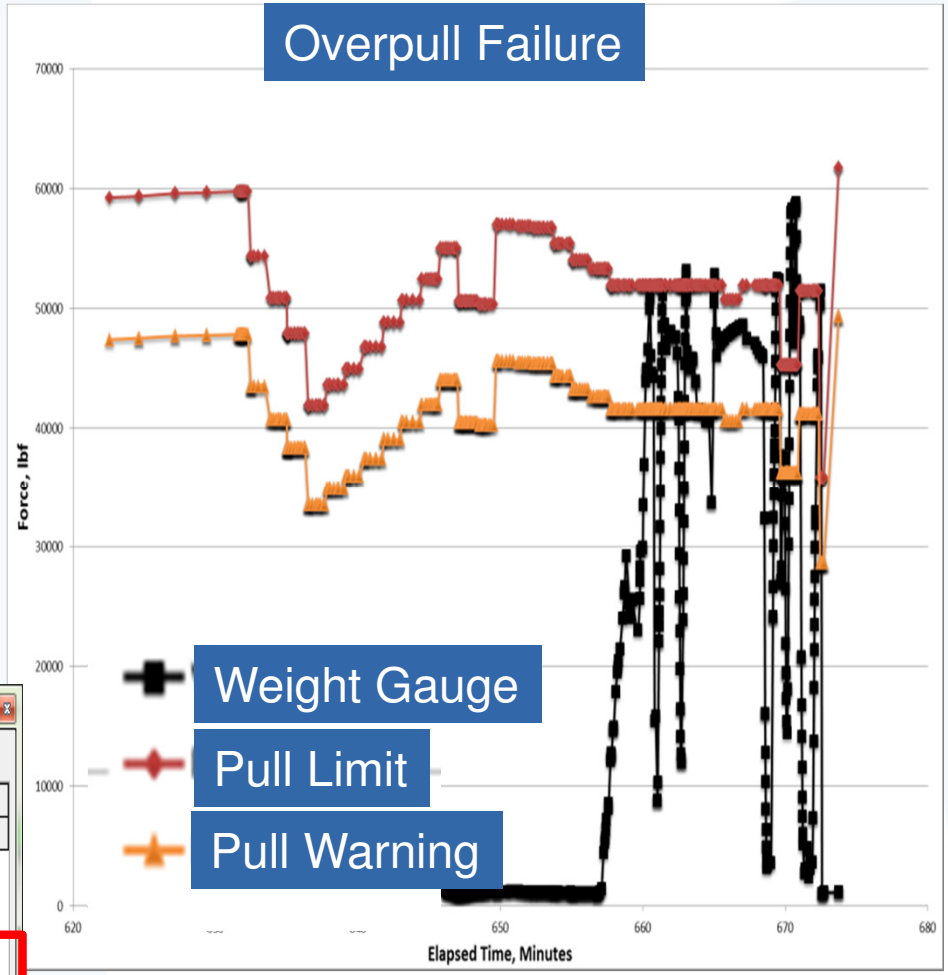


Version: 0.1 Beta

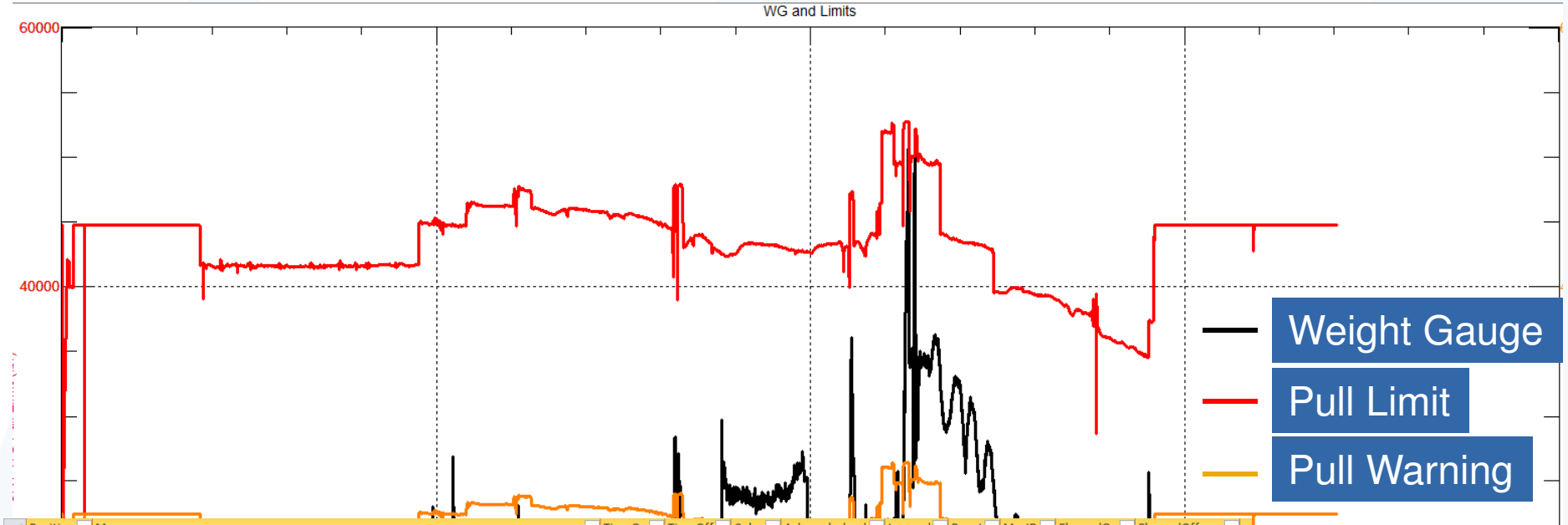
Help | Control Traffic Lights | Traffic Lights Log

Time		Light	Position	Message	Status		
On	Off				Ack	Ignored	Reset
12:36:27	12:36:29		Surface	Pump Pressure High			
12:36:27	12:36:29		Surface	Pump Pressure High			
[illegible]			Well	Casing Exit			
12:38:05	12:38:06		Surface	Weight Gauge Snub Limit			
12:38:06	12:38:07		Surface	Weight Gauge Snub Limit			
12:38:39	12:38:43		Well	Casing Exit			

Overpull Failure



Weight Gauge Warnings

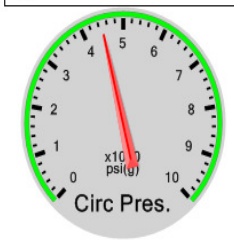


	Position	Message	TimeOn	TimeOff	Color	Acknowledged	Ignored	Reset	MsgID	ElapsedOn	ElapsedOff
145	Surface	Pump Pressure High	13:20:57	13:21:03	Yellow	false	false	false	11	1241.783936	1241.88391113281
146	Surface	Pump Pressure High	13:21:05	13:21:07	Yellow	false	false	false	11	1241.917236	1241.95068359375
147	Surface	Pump Pressure High	13:21:49	13:21:51	Yellow	false	false	false	11	1242.650635	1242.68395996094
148	Surface	Pump Pressure High	13:21:53	13:23:01	Yellow	false	false	false	11	1242.717285	1243.8505859375
149	Surface	Pump Pressure High	13:28:07	13:28:09	Yellow	false	false	false	11	1248.950562	1248.98400878906
150	Surface	Pump Pressure High	13:28:17	13:30:57	Yellow	false	false	false	11	1249.11731	1251.78393554688
151	Surface	Pump Pressure High	13:31:15	13:44:45	Yellow	false	false	false	11	1252.083984	1265.583984375
152	Surface	Weight Gauge Pull Limit	13:36:37	13:37:13	Yellow	false	false	false	19	1257.450562	1258.05065917969
153	Surface	Weight Gauge Pull Limit	13:37:15	13:37:27	Yellow	false	false	false	19	1258.083984	1258.28393554688
154	Surface	Weight Gauge Pull Limit	13:37:35	13:37:47	Yellow	false	false	false	19	1258.417236	1258.61730957031
155	Surface	Weight Gauge Pull Limit	13:37:53	13:37:57	Yellow	false	false	false	19	1258.717285	1258.78393554688
156	Surface	Weight Gauge Pull Limit	13:38:07	13:38:09	Yellow	false	false	false	19	1258.950684	1258.98400878906
157	Surface	Weight Gauge Pull Limit	13:38:13	13:38:23	Yellow	false	false	false	19	1259.050659	1259.21728515625
158	Surface	Weight Gauge Pull Limit	13:38:35	13:38:39	Yellow	false	false	false	19	1259.417236	1259.48400878906
159	Surface	Weight Gauge Pull Limit	13:38:51	13:38:53	Yellow	false	false	false	19	1259.68396	1259.71728515625
160	Surface	Weight Gauge Pull Limit	13:39:07	13:39:11	Yellow	false	false	false	19	1259.950562	1260.01733398438
161	Surface	Weight Gauge Pull Limit	13:39:19	13:39:21	Yellow	false	false	false	19	1260.150635	1260.18395996094
162	Surface	Weight Gauge Pull Limit	13:39:27	13:39:31	Yellow	false	false	false	19	1260.283936	1260.3505859375
163	Surface	Weight Gauge Pull Limit	13:39:33	13:39:41	Yellow	false	false	false	19	1260.383911	1260.51733398438
164	Surface	Weight Gauge Pull Limit	13:39:47	13:39:53	Yellow	false	false	false	19	1260.61731	1260.71728515625
165	Surface	Weight Gauge Pull Limit	13:39:59	13:40:09	Yellow	false	false	false	19	1260.817261	1260.98400878906

BHA Position/Time-Distance

Depth [ft]	Tripping Speed [ft/min]	% Fatigue	Max Trips
11000	25.00	12.6	90
Liquid Rate [bpm]	**N2 Rate [scfm]**	**WS Press at GN [psi(g)]**	**% Stress**
3.5	0	3510	24.6

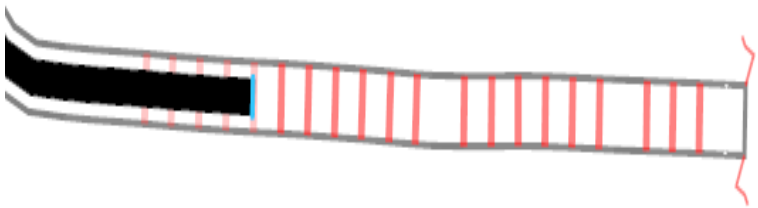
Surface	OK	Unload Well Data
CT/BHA	OK	Help
Well	OK	



4488

11505

2243

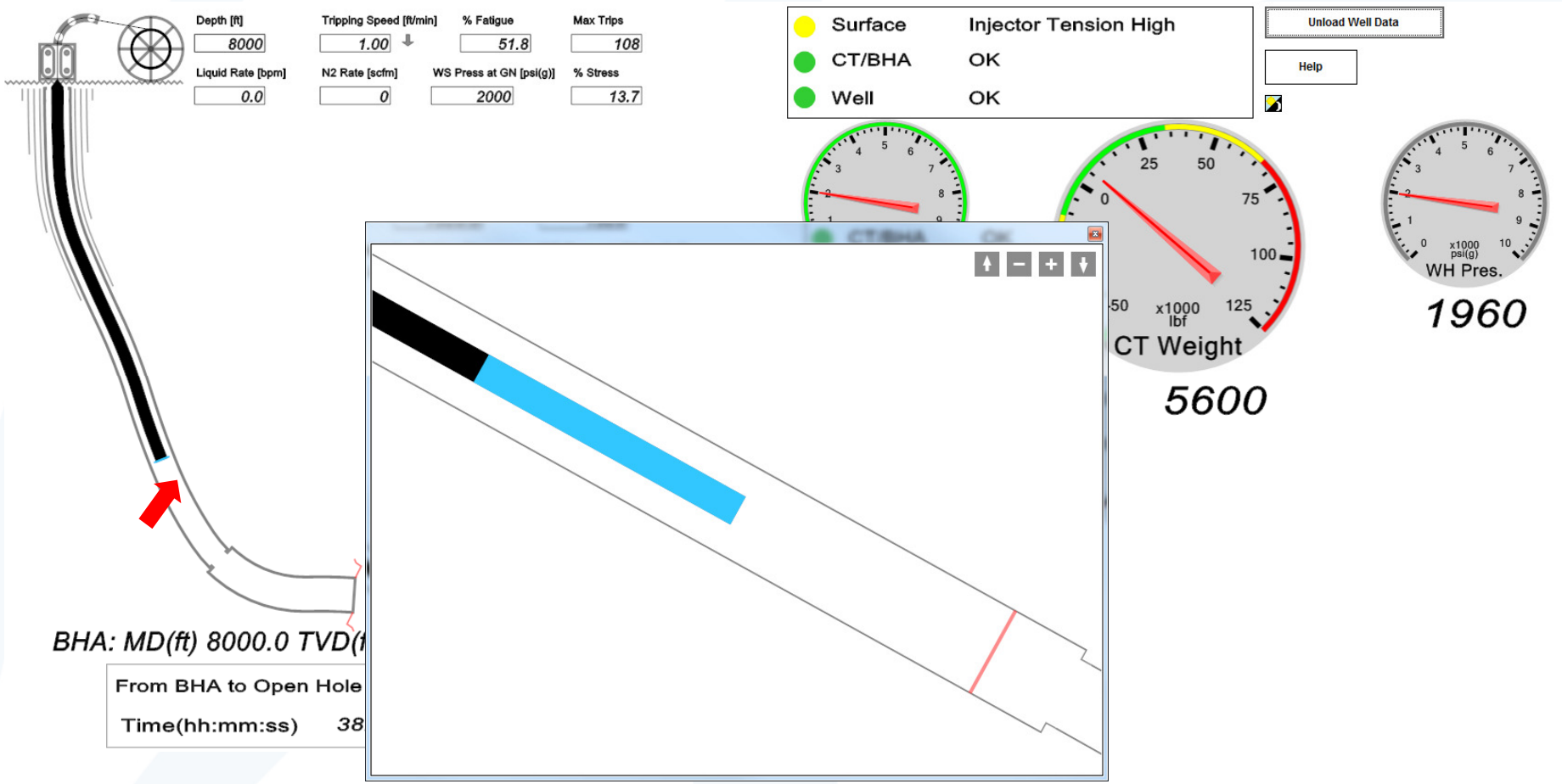


BHA: MD(ft) 11000.0 TVD(ft) 8218.1 DEV(deg) 88.3

From BHA to Plug (ID=0.00 in)

Time(hh:mm:ss) *00:12:24* Distance *310* ft

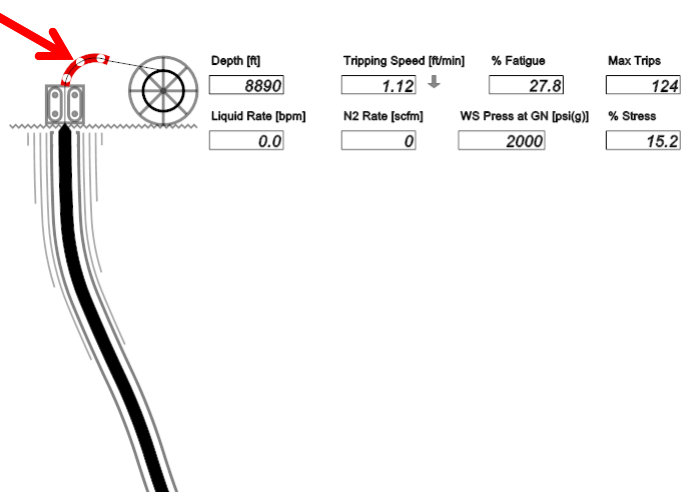
Well Zoom:


Depth [ft]
8000
Tripping Speed [ft/min]
1.00
% Fatigue
51.8
Max Trips
108
Liquid Rate [bpm]
0.0
N2 Rate [scfm]
0
WS Press at GN [psi(g)]
2000
% Stress
13.7
Surface
Injector Tension High
CT/BHA
OK
Well
OK
Unload Well Data
Help
CT Weight
5600
x1000 lbf
WH Pres.
1960
BHA: MD(ft) 8000.0 TVD(f
From BHA to Open Hole
Time(hh:mm:ss)
38

Weld/Slips on Gooseneck

Weld/Slip ‘Warning distance’ away

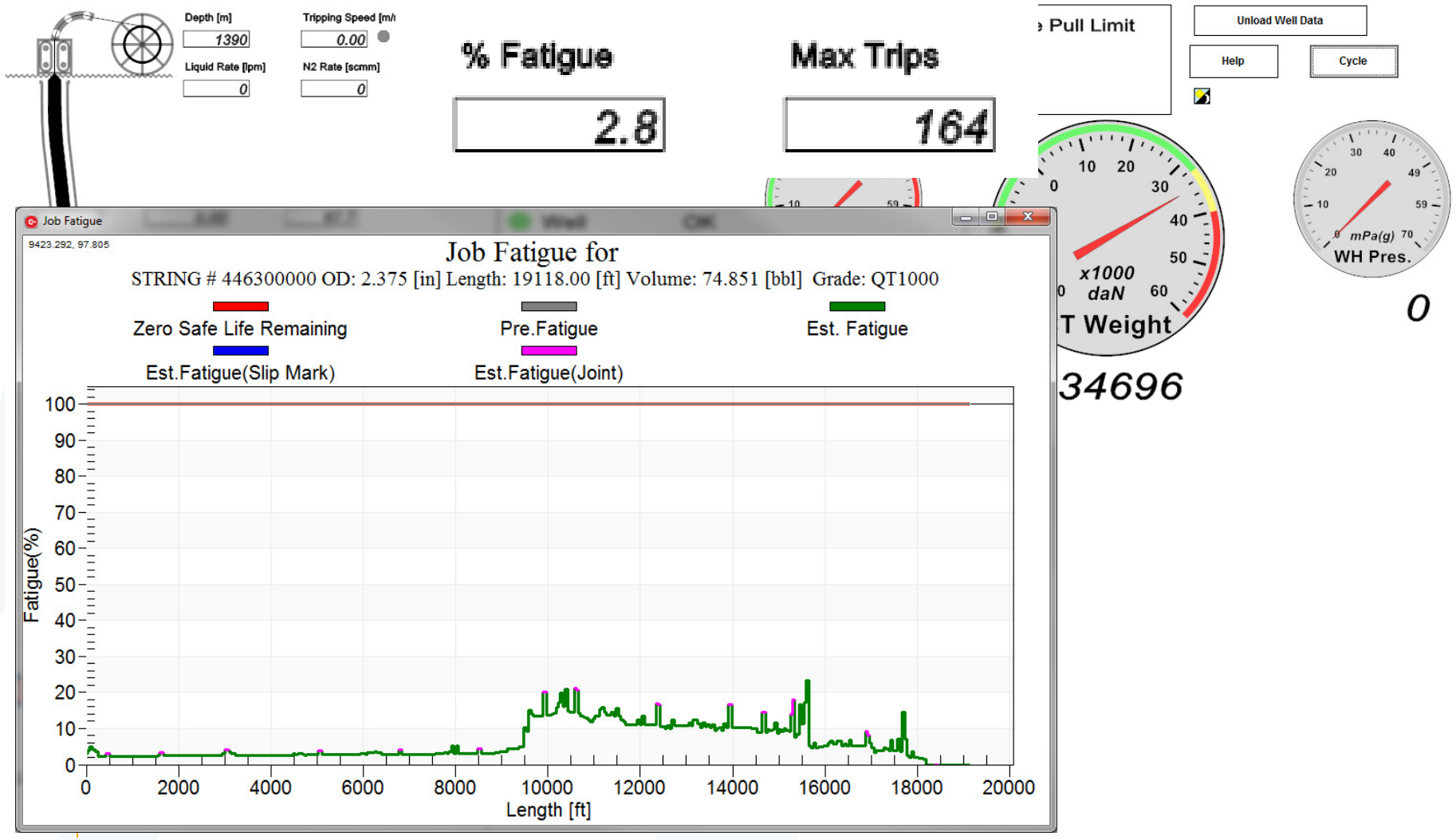
Weld/Slip on gooseneck



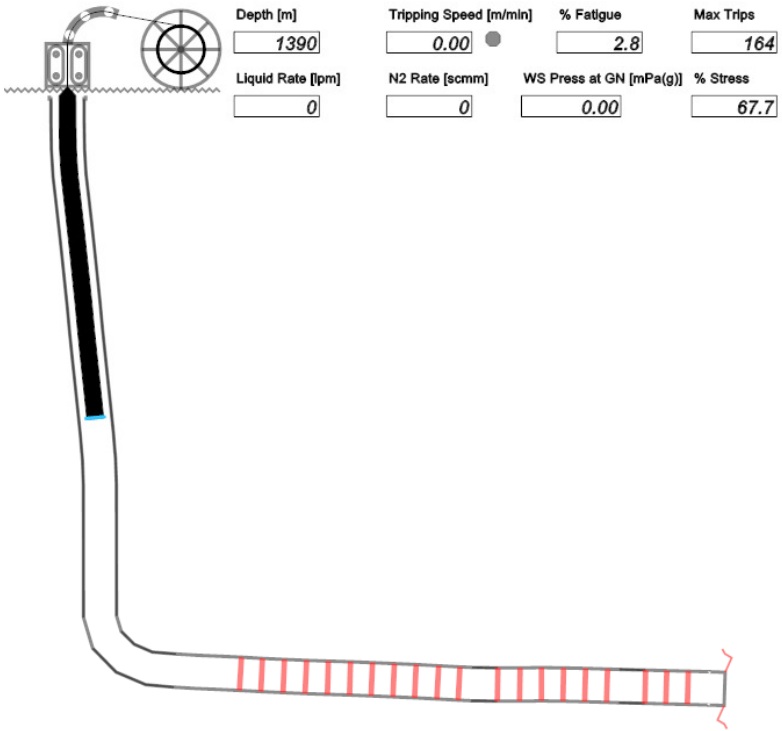
Traffic lights also flag within ‘Warning distance’

1) High Fatigue section [>90%]
2) Minimal trips remaining [<5]

Updated Fatigue:

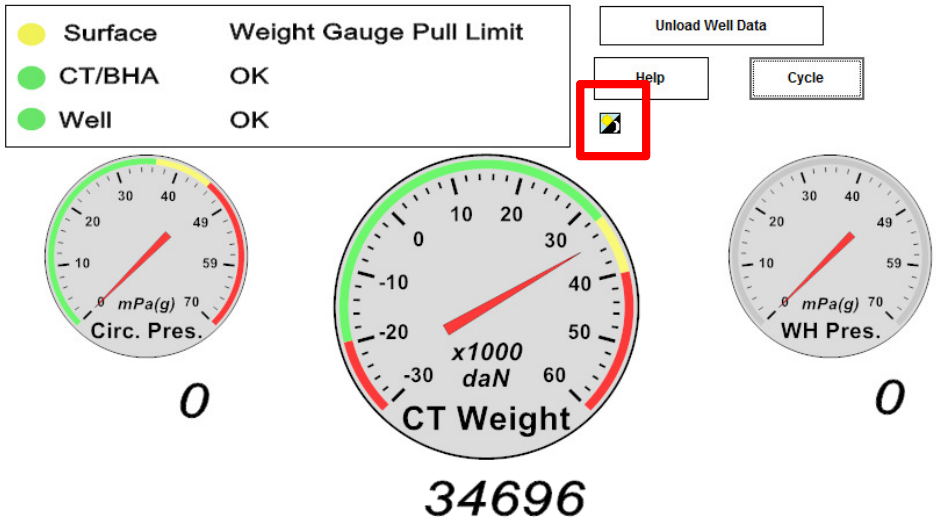


Ergonomics: Day/Night

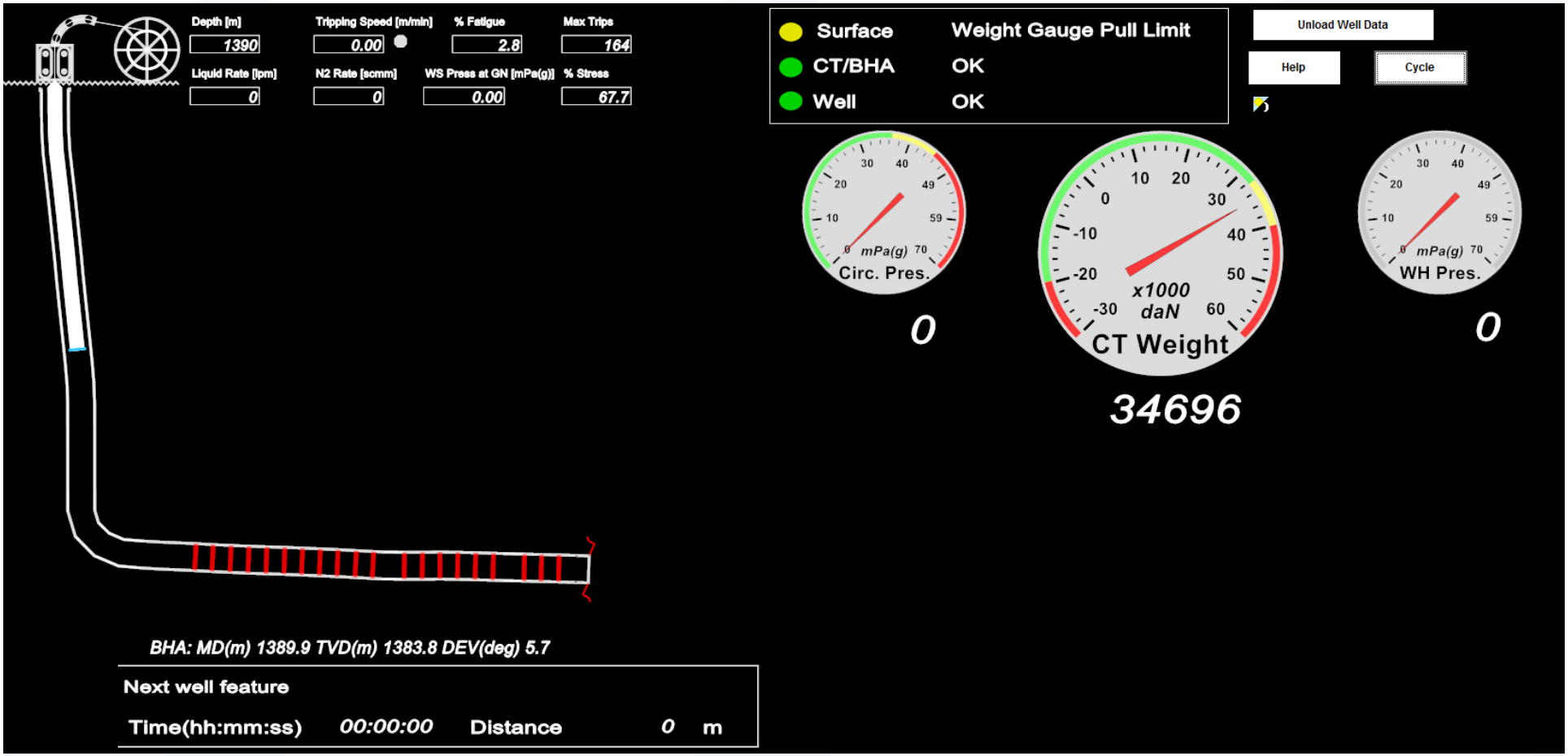


BHA: MD(m) 1389.9 TVD(m) 1383.8 DEV(deg) 5.7

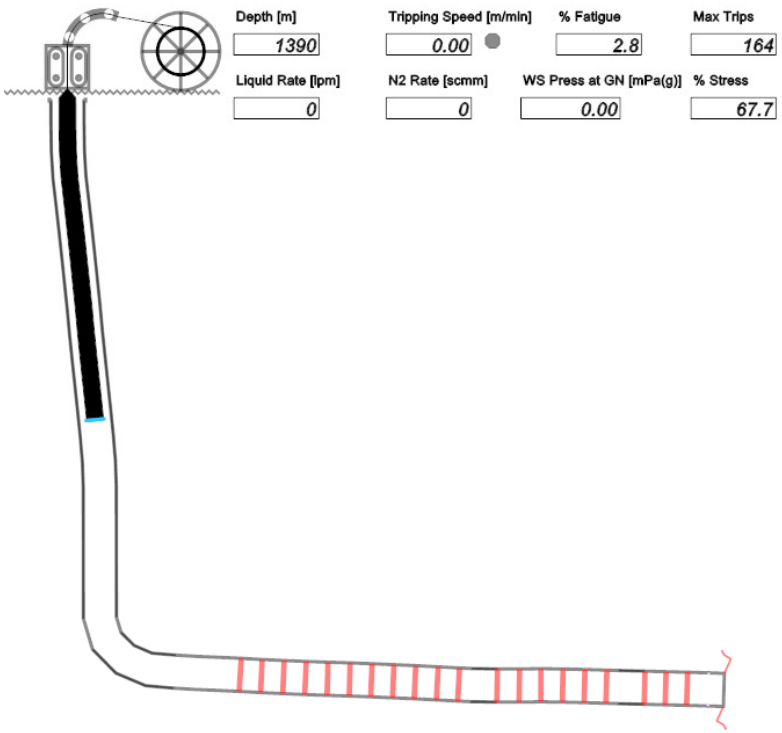
Next well feature				
Time(hh:mm:ss)	*00:00:00*	Distance	*0*	m



Ergonomics: Day/Night



Ergonomics Font size



Depth [m]	Tripping Speed [m/min]	% Fatigue	Max Trips
1390	0.00	2.8	164
Liquid Rate [lpm]	**N2 Rate [scmm]**	**WS Press at GN [mPa(g)]**	**% Stress**
0	0	0.00	67.7

BHA: MD(m) 1389.9 TVD(m) 1383.8 DEV(deg) 5.7

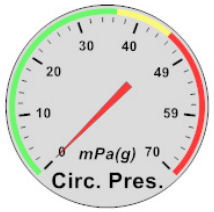
Next well feature

Time(hh:mm:ss) *00:00:00* Distance *0* m

Surface	Weight Gauge Pull Limit
CT/BHA	OK
Well	OK

Unload Well Data

Help Cycle

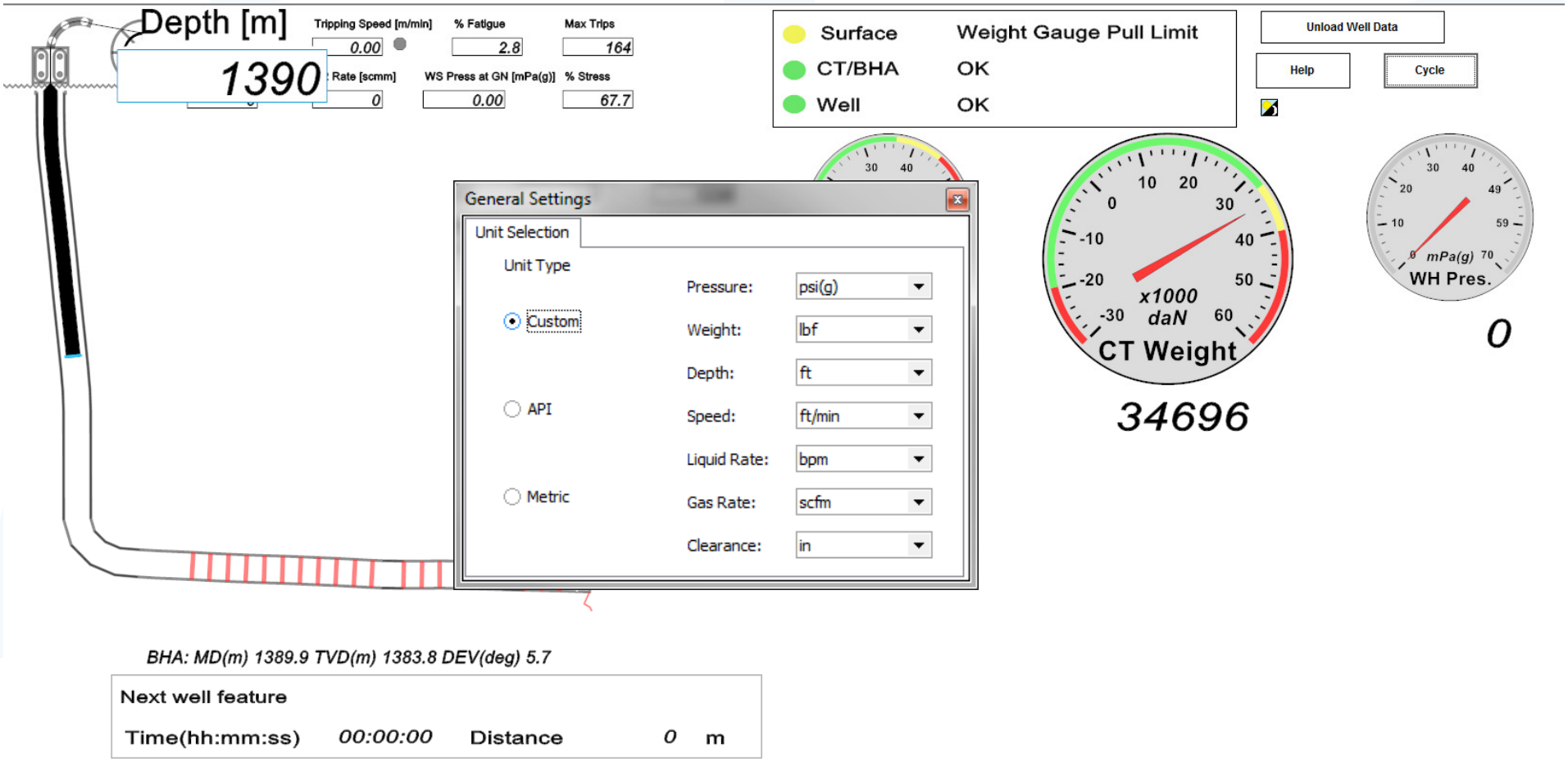


0

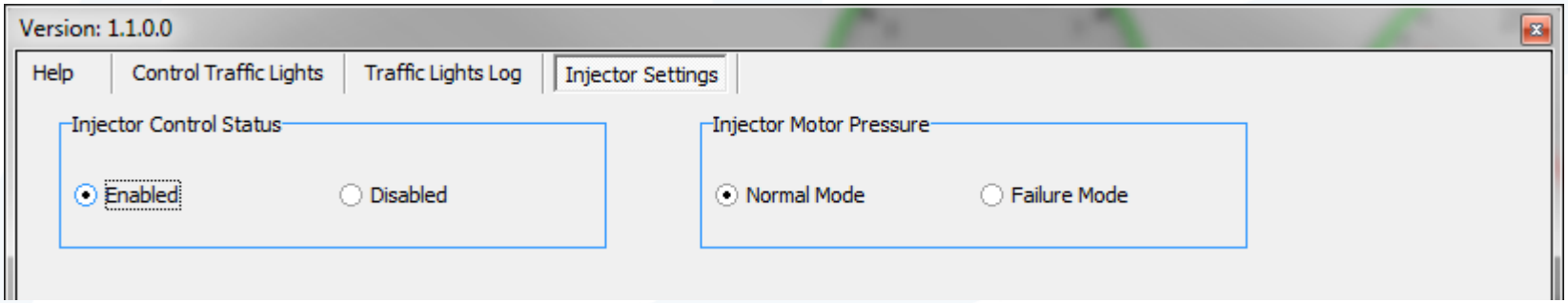
34696

0

Ergonomics Font size



Injector Control



1) Limit Max Injector Motor Pressure [relief valve]
2) Lower limit on Traction Pressure [min manual/calculated values]

Where Engineering Meets Execution

Pre Job Engineering Circa

Plan

Job Monitoring Dynamic Limits/Warnings Circa RealTime

Re-Tune

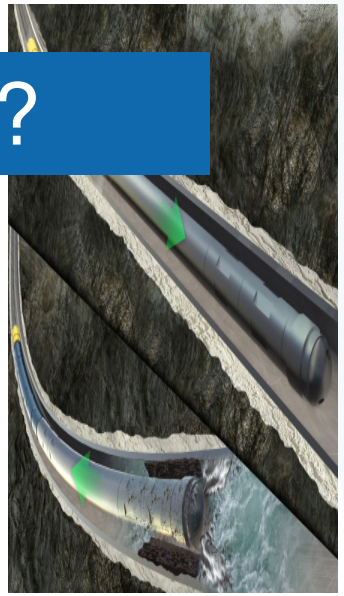
Injector control Limits

Control

Downhole Feedback TeleCoil™

Optimize

Controlled performance



Automate

Thank-you for your time. Questions?