Background

The design is for a drilling engineering software which communicates with data servers at the well location. It receives drilling data, plots them, does some internal calculations, and provides engineering solutions.

Main Window

The main window has the software title, a top ribbon, a toolbar on the left, some control buttons on top-right corner, and some metric buttons on the right-hand side.

The window title displays the software name and version. Also, the window starts in Fullscreen mode by default. Then, the user can right click on the top ribbon and choose to change window state or close it.

The top ribbon has three main sections. In the left side of the ribbon is the company logo. The middle of the ribbon displays the operation mode which is being detected by interpreting the data from the well location. The right-hand side of the ribbon contains a switch for selecting between day and night themes.

The left-hand side toolbar has multiple items, each of them is linked to a tab. The software contains seven tabs including: Control Screen, Well Info, Well Data, WITS, Support, Settings, and New Well. The default screen, however, is the Control Screen. The tabs should run in parallel and do their duties, however, they do not sit beside each other and only one of them is displayed at a time. The displaying tab is selectable upon a click on the toolbar and the toolbar gets highlighted when a tab is selected.

On the top right-hand side and below the top ribbon's day/night switch are some control buttons which indicate the current state of the system and allow opening their own forms and changing some parameters with clicking them.

Below the control buttons are some metric buttons which read and display some important data from the servers. They also allow opening various forms and adjusting some parameters upon clicking on them. It is important that they show the units right. For example, the unit for pump rate is m^3/min.

Control Screen

The main section in the control screen is the graph area. This section reads the streaming data from the servers and plots them. The main requirements for the graph section are:

Each plot has two to four curves and each curve should update by the streaming data from the server (time on y-axis and a value for each curve on x-axis).

Plots should have their legend on top, indicating (the updating) min and max of the streaming data.

The min and max for each curve are different (e.g. -10 to 10 for curve one, 0 to 2500 for curve 2), the plots should display each curve clearly according to the legend values on top.

User should be able to click on each curve (on the top legend) to select: curve data, color, ...

User should be able to scroll the y-axis (and all the linked plots correspond to that!) or move the curves in the plots up and down by holding the mouse on one of them.

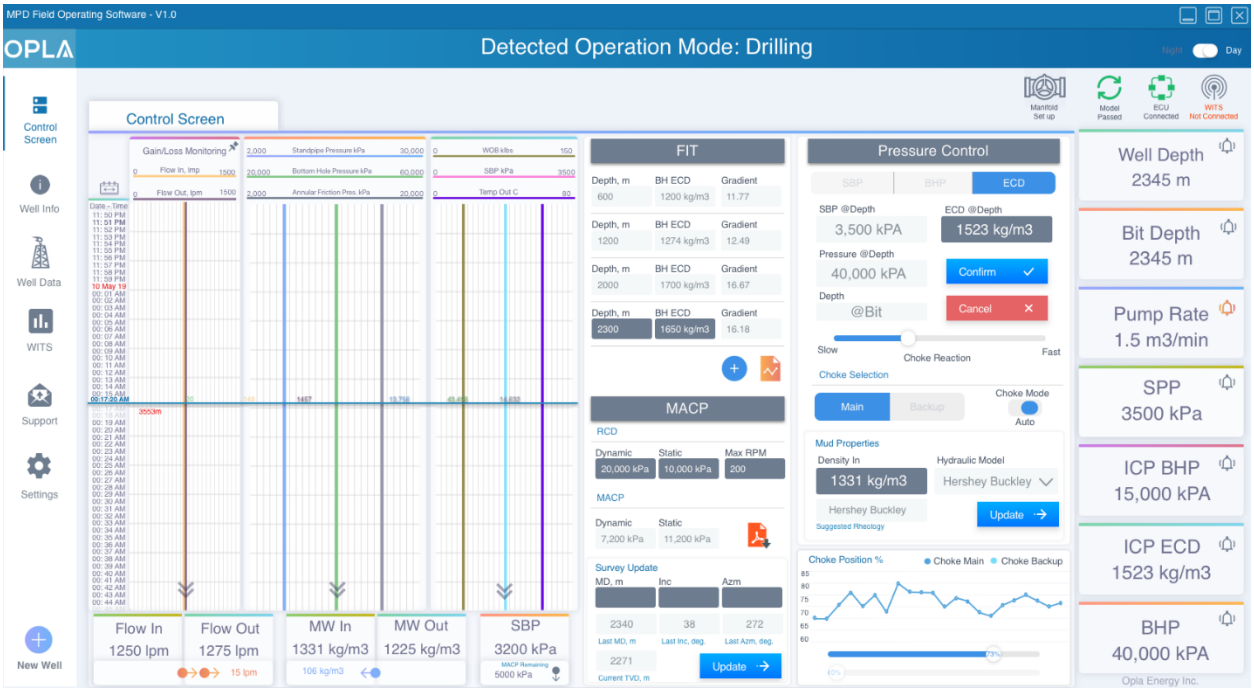
User should be able to see desired x and y values for each curve (as indicated in the figure) by a mouse event as a horizontal line

graphs' typical y vector is like: y=['2019-05-22 1:00:00','2019-05-22 2:00:00','2019-05-22 3:00:00', '2019-05-22 4:00:00','2019-05-22 5:00:00']

graphs' typical x vectors can be like: x1=[-10,-3,-1,2,7], x2=[250,300,525,1250,1850]

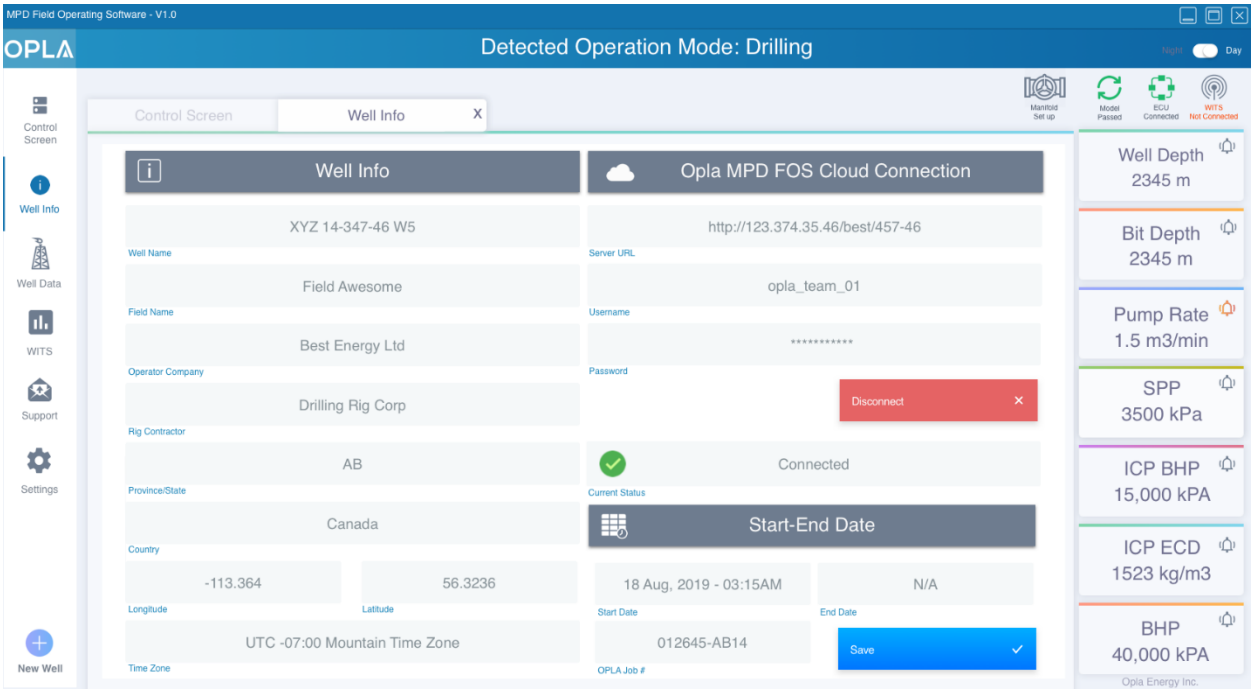
at the bottom of the graphs are some metric buttons which indicate the plotted values. They should be clickable (for adjusting some properties). Below the metric buttons are some arrows indicators which highlight the difference between the plot lines and their size is in accordance to the calculated value.

The rest of the Control Screen is clearly presented in the following figure.



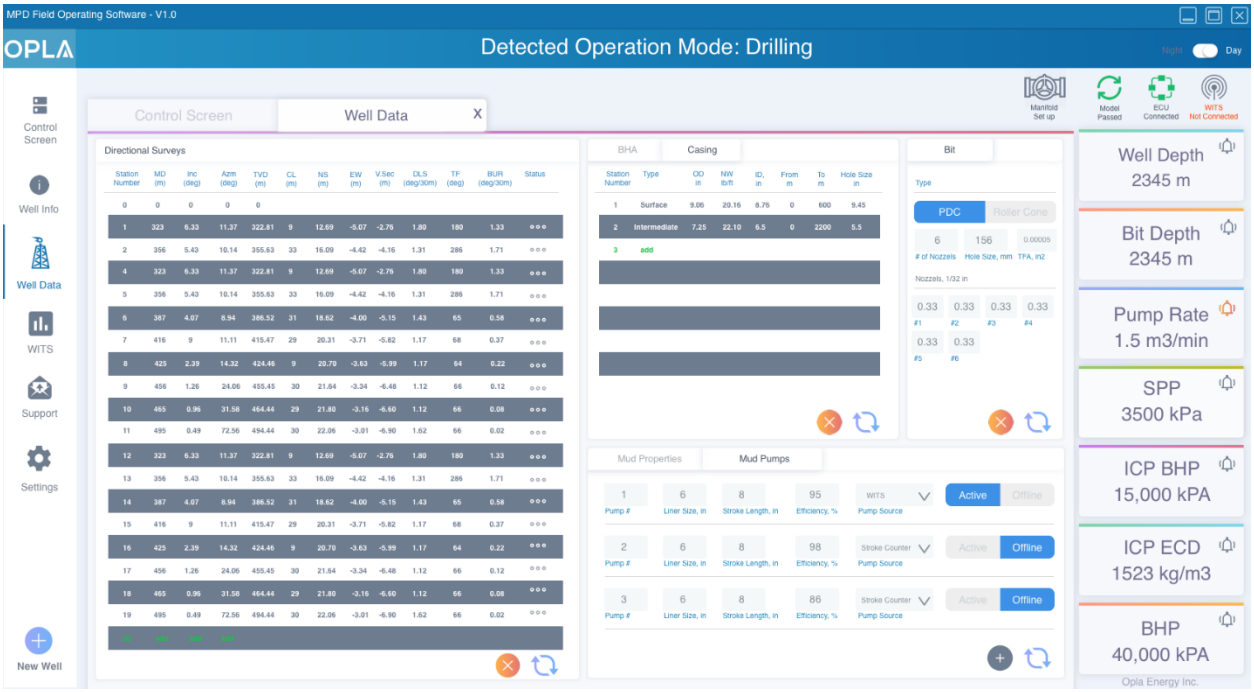
Well Info

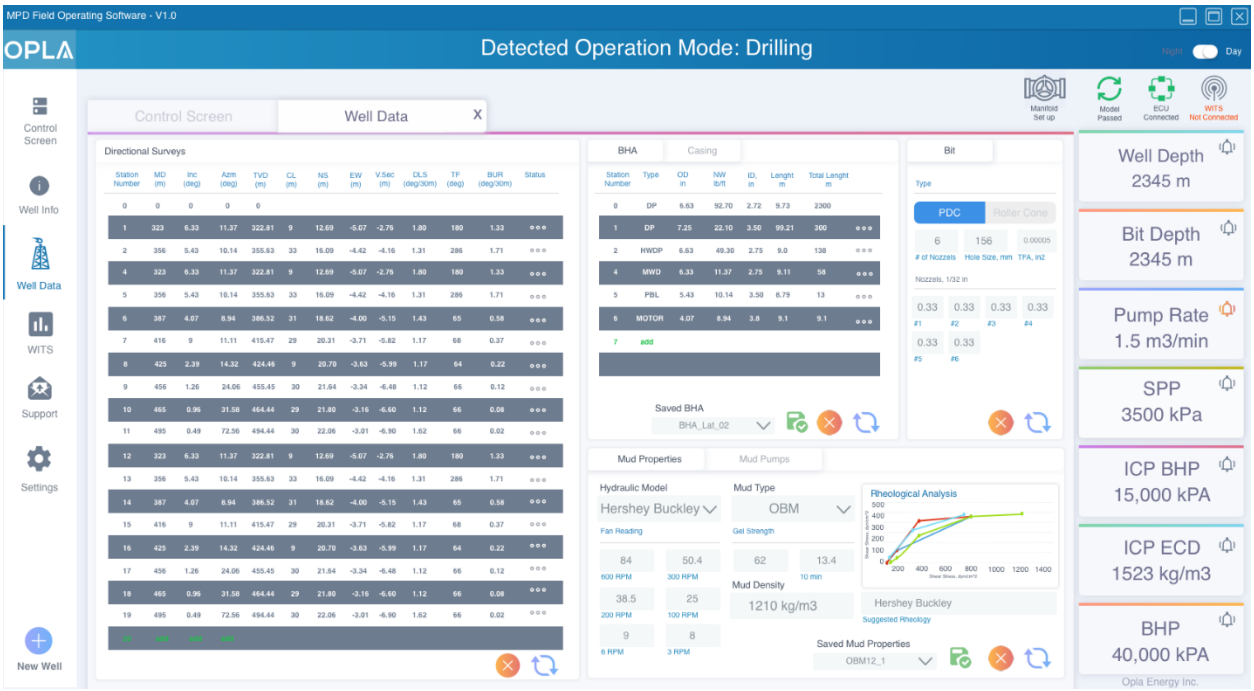
Well info tab functionality and design is also very clear and as the following figures. The user can edit all the data in all the tabs and the software will update their values in the server if changed by user.



Well Data

For this tab, the user should be able to click the dots in the tables to open a form for revising the data (in this table and in the linked database).


MPD Field Operating Software - V1.0
OPLA
Detected Operation Mode: Drilling
Night
Day
Control Screen
Well Info
Well Data
WITS
Support
Settings
New Well
Control Screen
Well Data
Manifold Set up
Model Passed
ECU Connected
WITS Not Connected
Directional Surveys
Station Number
MD (m)
Inc (deg)
Azm (deg)
TVD (m)
CL (m)
NS (m)
EW (m)
V.Sec (m)
DLS (deg/30m)
TF (deg)
BUR (deg/30m)
Status
BHA
Casing
Station Number
Type
OD in
NW lb/ft
ID, in
From m
To m
Hole Size in
1 Surface 9.06 29.16 8.76 0 600 9.45
2 Intermediate 7.25 22.10 6.5 0 2200 5.5
3 add
Bit
Type
PDC
Roller Cone
6
156
0.00005
# of Nozzels
Hole Size, mm
TFA, in2
Nozzels, 1/32 in
0.33
0.33
0.33
0.33
#1
#2
#3
#4
0.33
0.33
#5
#6
Mud Properties
Mud Pumps
1
6
8
95
WITS
Pump #
Liner Size, in
Stroke Length, in
Efficiency, %
Pump Source
Active
Offline
2
6
8
98
Stroke Counter
Pump #
Liner Size, in
Stroke Length, in
Efficiency, %
Pump Source
Active
Offline
3
6
8
86
Stroke Counter
Pump #
Liner Size, in
Stroke Length, in
Efficiency, %
Pump Source
Active
Offline
Well Depth
2345 m
Bit Depth
2345 m
Pump Rate
1.5 m3/min
SPP
3500 kPa
ICP BHP
15,000 kPa
ICP ECD
1523 kg/m3
BHP
40,000 kPa
Opla Energy Inc.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Detected Operation Mode: Drilling
Night
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Control Screen
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ECU Connected
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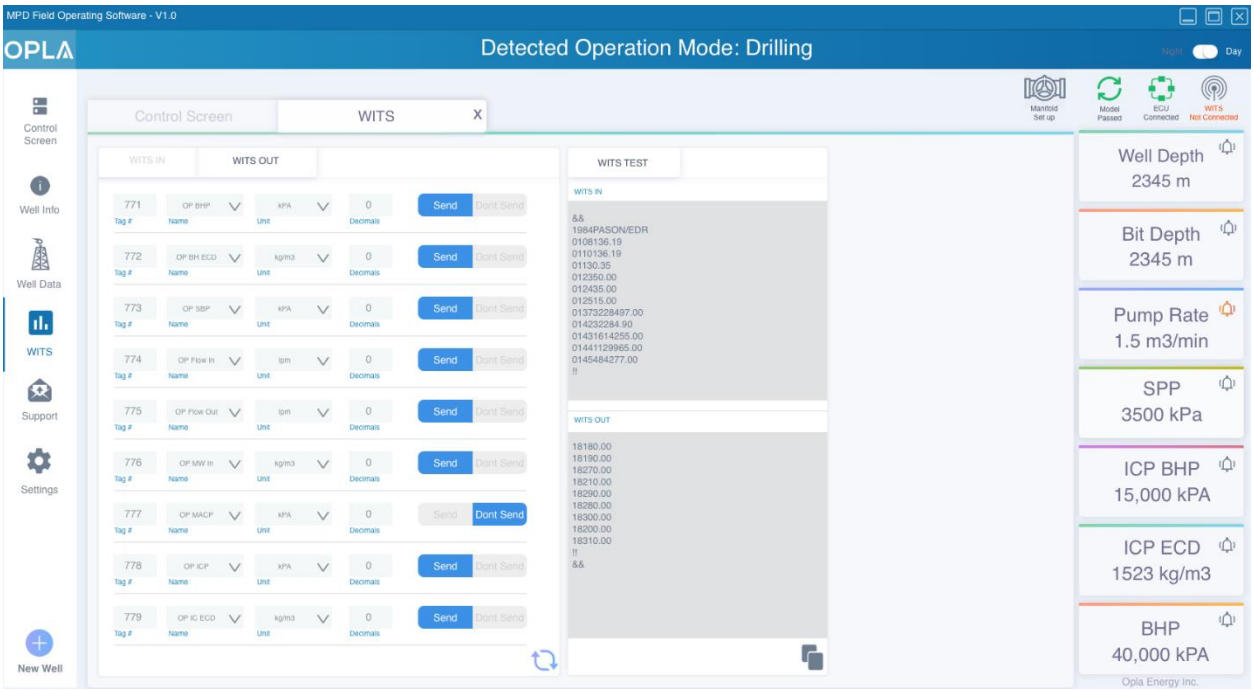
Directional Surveys
Station Number
MD (m)
Inc (deg)
Azm (deg)
TVD (m)
CL (m)
NS (m)
EW (m)
V.Sec (m)
DLS (deg/30m)
TF (deg)
BUR (deg/30m)
Status
BHA
Casing
Station Number
Type
OD in
NW lb/ft
ID, in
Lenght m
Total Lenght m
0 DP 6.63 92.70 2.72 9.73 2300
1 DP 7.25 22.10 3.50 99.21 300
2 HWDP 6.63 49.30 2.75 9.0 138
4 MWD 6.33 11.37 2.75 9.11 58
5 PBL 5.43 10.14 3.50 8.79 13
6 MOTOR 4.07 8.94 3.8 9.1 9.1
7 add
Saved BHA
BHA_Lat_02
Bit
Type
PDC
Roller Cone
6
156
0.00005
# of Nozzels
Hole Size, mm
TFA, in2
Nozzels, 1/32 in
0.33
0.33
0.33
0.33
#1
#2
#3
#4
0.33
0.33
#5
#6
Mud Properties
Mud Pumps
Hydraulic Model
Hershey Buckley
Fan Reading
84
50.4
600 RPM
300 RPM
38.5
25
200 RPM
100 RPM
9
8
6 RPM
3 RPM
Mud Type
OBM
Gel Strength
62
13.4
10 min
Mud Density
1210 kg/m3
Rheological Analysis
Hershey Buckley
Suggested Rheology
Saved Mud Properties
OBM12_1
Well Depth
2345 m
Bit Depth
2345 m
Pump Rate
1.5 m3/min
SPP
3500 kPa
ICP BHP
15,000 kPa
ICP ECD
1523 kg/m3
BHP
40,000 kPa
Opla Energy Inc.

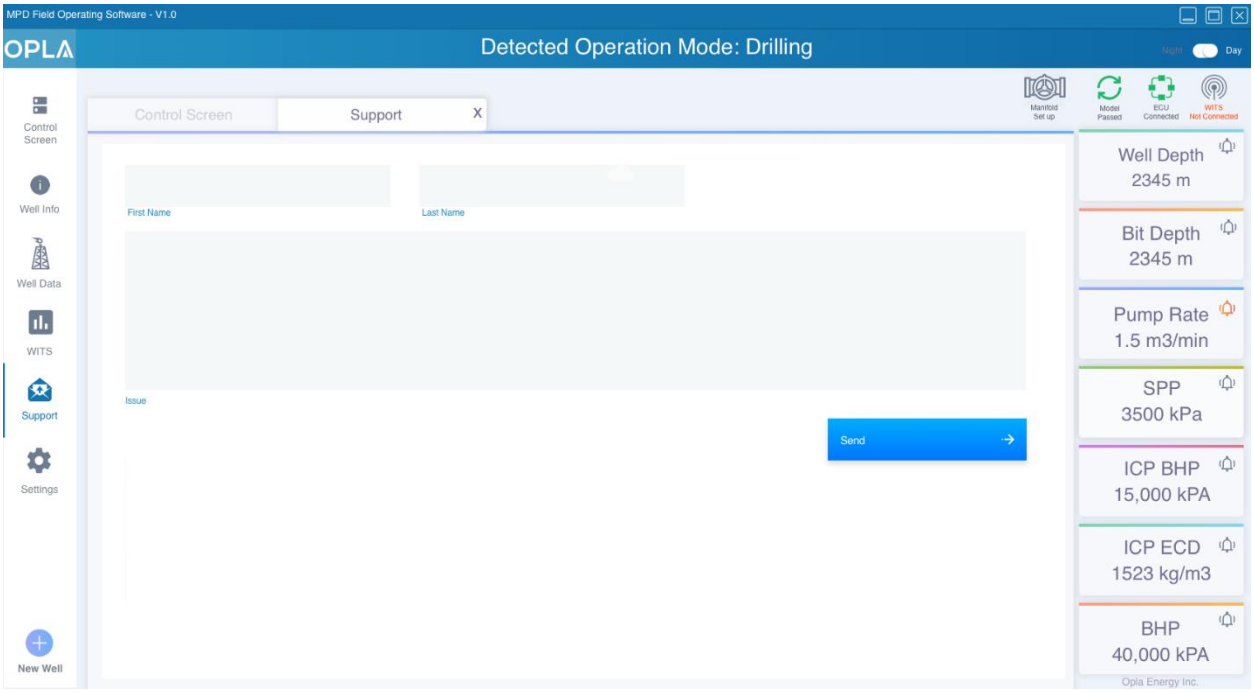
WITS

In this tab the user defines and adjust some values and if the send button is active, the data will be sent to server by pressing the enter key in Decimals lineEdit. The WITS IN and WITS OUT textEdits display the text data from the server.



Support

Simple and evident in the following graph.



Settings

Setting is left blank for now!