



PRIME WELL
SERVICE
INSTRUMENTATION

Data Management Software
Data Acquisition Software for Well Service Applications
Technical Specification V1.1 (03/23/2021)

WWW.FRACCONTROLS.COM

1 General Description

This document describes the technical parameters of the Prime Data Management Software DMS.

Prime DMS is a real-time data acquisition software, designed to match the operator's and engineer's needs for Well Service applications like Stimulation, Cementing, Coiled Tubing and similar applications. It provides simple to use recording, visualization and reporting for field usage and at the same time comprehensive features for data processing such as filtering, graphical formatting and analyzation as well as job information management.

DMS auto-detects and shows the connected devices. The software reconnects automatically in case of a connection loss during the operation and it repeats the last acquired values of the corresponding hardware device until a user definable timeout occurs, established connections are not affected. Different interfaces and protocols are available at the same time for parallel usage.

It is possible to save additional job related information such as job type, location, operator name and comments but also other user definable information for each acquired job to the database for later reference and also for usage in automatic generated post job reports. The operator is able to save his preferred settings for window appearance including scaling, colors, shown physical dimensions and others for charts, digital values and data tables in recallable templates that can be opened depending on the current job's needs.

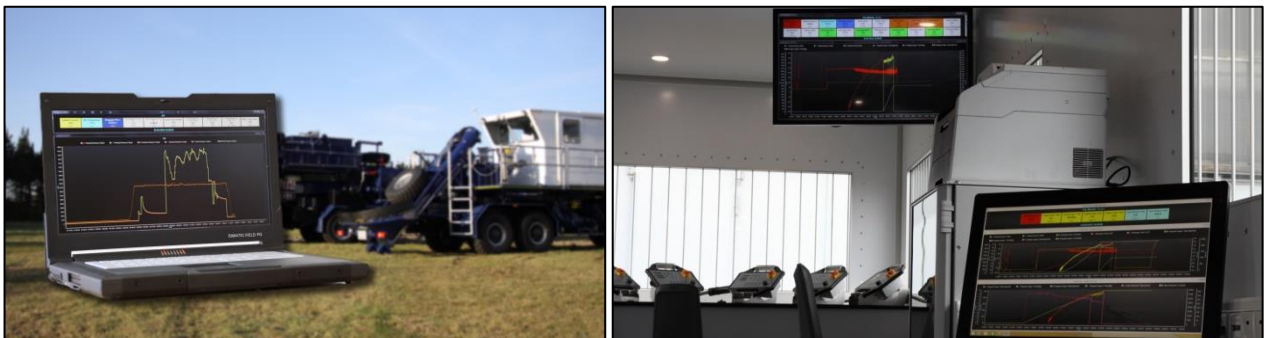


Figure 1: DMS example applications

The software connects to compatible hardware systems by Serial Port, by Ethernet or by WiFi. DMS is able to read the Prime proprietary data protocol but also ASCII and Modbus data by 3rd party systems. The data storage rate is variable.

The software provides a module to the operator for entering mathematic formulas to process acquired data sets including the generation of new physical dimensions. The mathematics module includes but not limited to addition, subtraction, multiplication, division, brackets and constants. Formulas can be saved in recallable sets.

DMS is able to handle metric and imperial dimension systems in parallel and provides on the fly switch over during operation. The software is able to handle various text data formats such as dot or comma as decimal point, different data separators such as comma, semicolon and others and different time formats.

The software provides a function to send out unencrypted ASCII data to 3rd party devices as foreign data acquisition systems or PCs by Serial Port, by Ethernet or by WiFi. Port- and channel settings can be saved in recallable sets.

The software handles any kind of numeric value in any kind of physical dimension as well as switching on-the-fly between different units. DMS comes with a wide set of pre-defined units but it is also possible for the user to enter new units and systems.

Due to the SQL based structure, data can easily be shared in the local network but also via VPN connections over the internet.

DMS runs on any standard MS Windows PC such as Notebooks, Tablets and Touch PCs.

2 List of Key-Functions

The availability of these functions depends on the DMS version. DMS Pro covers all.

- Real-time recording
- Charts, digital displays and round gauges
- Importing and exporting CSV data allows processing in third party software such as Simulation, CT-fatigue calculation and others
- Acoustic and visual warnings and alarms
- User defined mathematical functions
- Text event logging for annotation and reporting
- Saving of individual definable job related information for later reference and autopopulation on post job reports
- Multiscreen usage
- Connects to any compatible hardware (TCP via Ethernet or Wifi, Serial, ASCII, Modbus)
- Modify data (filter, offset,...)
- Back up job data incl. events and job properties
- Save and load window templates
- Analyzation and commenting of charts
- Exporting of charts
- Automatic post job reporting
- Collecting and combining data of different sources in one chart
- Sending of real-time ASCII data to third parties on site

3 Chart View

The software provides multiple user configurable horizontal charts at the same time on a single screen or on multiple screens. The charts are highly configurable during the operation, this includes but not limited to:

- Provide function to select on x-axis either job duration beginning at 0 or time of the day
- Auto scaling or manual scaling for each y-axis separately
- Set colors for individually channels
- Pan and zoom for all axes individually or at the same time
- Show and hide user selectable channels

- Change of colors for individual channels
- Free text annotation functionality with vertical cursors, horizontal lines and text boxes
- Automatic slope calculation for curves
- Show and hide free text events in relation to the corresponding time stamp
- Provide functionality for smoothing out fluctuations on acquired data channels
- Shows adjustable horizontal alarm lines and notifies the operator in case of violation visually and acoustically
- X-axis and Y-axis linear and logarithmic
- Save user created settings for recall at later time
- Change the physical dimension of each individual channel on the fly during operation within one system or from metric to imperial and backwards
- Easy export of plots to file and clipboard

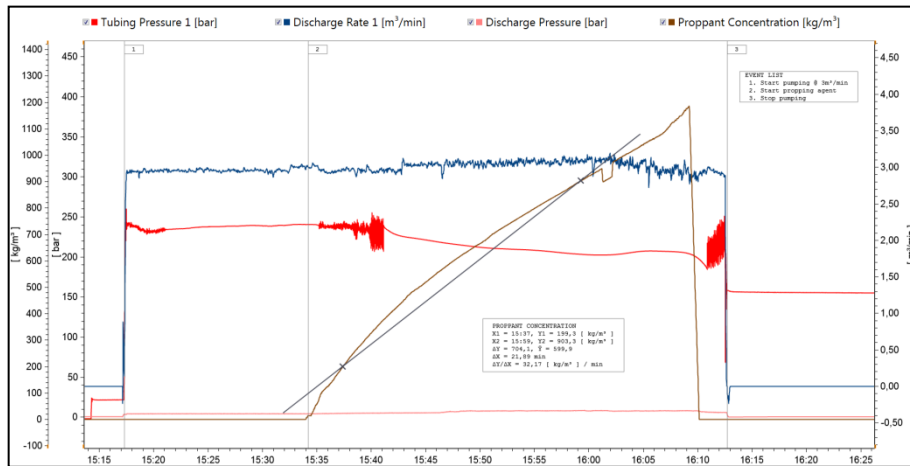


Figure 2: Example Chart View

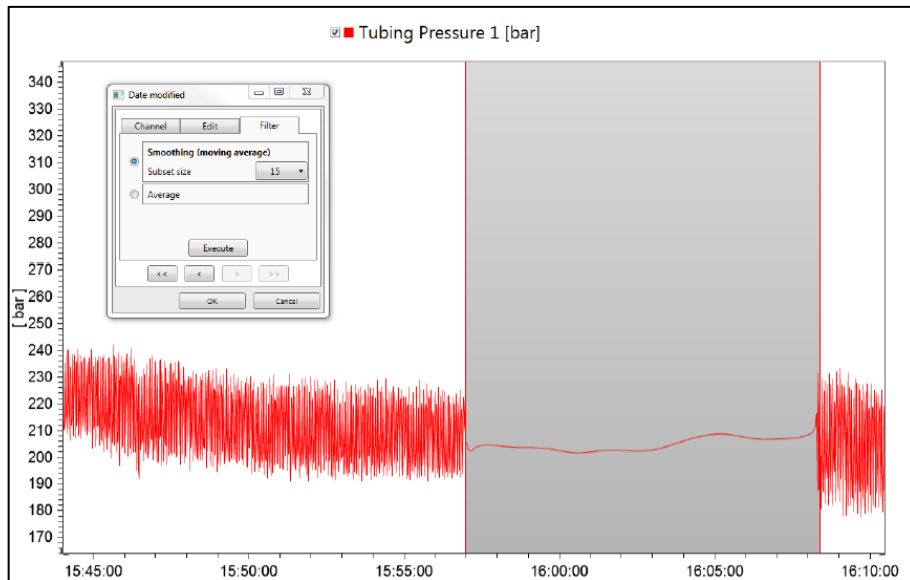


Figure 3: Smoothing in Chart View

4 Digital Display View

The software provides multiple user configurable digital value fields at the same time on a single screen or on multiple screens. The value fields shall be highly configurable during the operation, this includes but not limited to:

- Set colors for individually channels
- Adjust the field and text size
- Shows adjustable alarms and notifies the operator in case of violation visually and acoustically
- Change the physical dimension of each individual channel on the fly during operation within one system or from metric to imperial and backwards

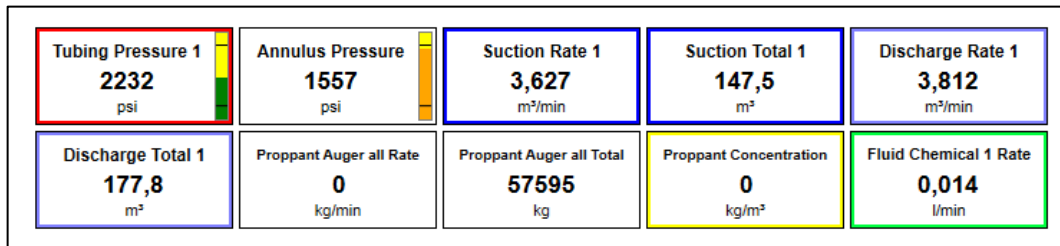


Figure 4: Example Digital View

5 Analog Gauge View

The software provides multiple user configurable gauge value fields at the same time on a single screen or on multiple screens. The value fields are configurable during the operation, this includes but not limited to:

- Set colors for individually channels
- Adjust the field size
- Shows adjustable alarms and notifies the operator in case of violation visually and acoustically
- Change the physical dimension of each individual channel on the fly during operation within one system or from metric to imperial and backwards



Figure 5: Example Digital View

6 Data Table

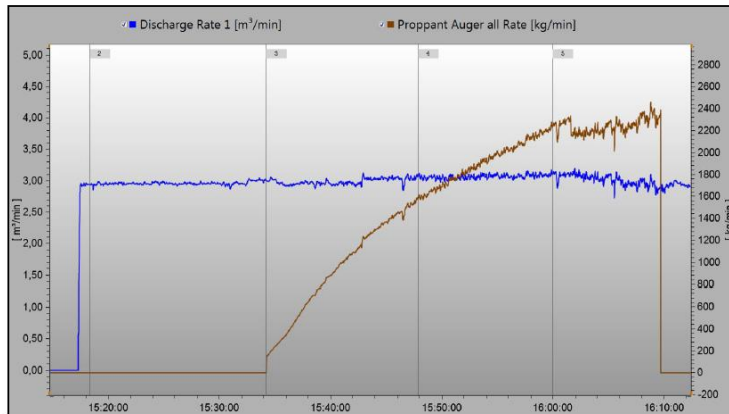
The software provides a data table visualization that provides copy and paste to MS Excel. The visualized physical dimension of each individual channel is changeable on the fly during operation within one system or from metric to imperial and backwards. The amount of lines can be reduced either by restriction to an upper number of records and by applying time based reduction filter.

ID	Time	Tubing Pressure 1 [psi]	Tubing Pressure 2 [psi]	Suction Rate 1 [m ³ /min]	Discharge Rate 1 [l/min]
1	01.07.2015 14:50:00	-36,38	-2901	0	0
599	01.07.2015 15:00:00	5614	-2901	0	0
1197	01.07.2015 15:10:00	5628	-2901	0	0
1795	01.07.2015 15:20:00	3368	-2901	2,948	2946
2393	01.07.2015 15:30:00	3468	-2901	2,776	2949
2991	01.07.2015 15:40:00	3331	-2901	2,845	2957
3589	01.07.2015 15:50:00	3073	-2901	1,97	3028
4187	01.07.2015 16:00:00	2967	-2901	2,309	3117
4785	01.07.2015 16:10:00	2947	-2901	1,605	2833
5383	01.07.2015 16:20:00	2258	-2901	0	0
5981	01.07.2015 16:30:00	2247	-2901	0	0
6579	01.07.2015 16:40:00	2232	-2901	3,627	3812

Figure 6: Example Data Table

7 Event Logger

The software provides a tool for logging free editable text events or text events that are picked from a predefined but user editable list with the corresponding timestamp to the data base. The events can be edited by text and timestamp at a later time and they can be populated to annotate charts. The list of events can be populated on automatic generated job reports.



ID	Time	Event	Tubing Pressure 1 [bar]
1	01.07.2015 15:04:19	Opened suction valve	388
2	01.07.2015 15:18:19	Start pumping @ 3m ³ /min	238
3	01.07.2015 15:34:12	Start propping agent	241
4	01.07.2015 15:47:51	Stage reaches bottom	216
5	01.07.2015 15:59:58	Reached max. concentration	203
6	01.07.2015 16:12:44	Stop pumping	154

Figure 7: Example Chart with Events

8 Job Report

The software provides fully automatic generated but highly customizable job reports. The operator is able to change the report's background template to incorporate additional static information such as company logos, fixed texts and optical adaptations. The operator can define the amount and appearance of populated charts, digital numbers and tables by changing channel colors and physical dimension. It is possible to generate reports that include other physical dimensions than the initially acquired dimension, i.e. acquired data comes in l/min and populated shall be bbl/min. The desired settings can be saved by the operator in recallable report templates. Logged events are marked on the populated charts in relation to the corresponding timestamp. Additional job related information such as job type, location, operator name and comments but

also other user definable information can also be auto populated on the generated report. Generated reports can be saved as pdf documents but also combined with MS Excel compatible csv files.

The software also provides semi-automatic but interactive generated and highly customizable job reports. Beside the customizations in the fully automatic report, the operator is able to define the amount, colors, order, selected channels, physical dimensions, data smoothing, scaling and others of populated charts, digital numbers and tables by changing on the fly during the reporting process.

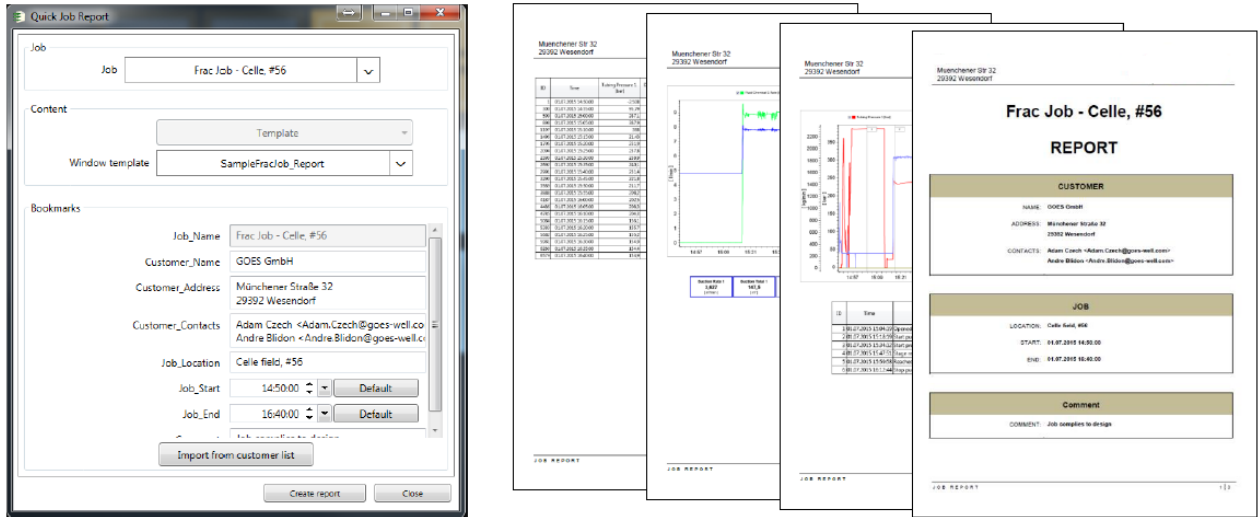


Figure 8: Quick Job Report Tool

9 Data Import

The software is able to import various data formats as csv, txt and las, but not limited to, into the data base for visualization and reporting purposes. The import function is able to handle dot and comma as decimal point, different data separators such as comma, semicolon and others and different time formats.

10 Data Export

The software is able to export various data formats such as csv and txt, but not limited to, from the data base files for further processing in foreign software tools like MS Excel and others. The export function is able to handle dot and comma as decimal point, different data separators such as comma, semicolon and others and different time formats.

11 Bottom Hole Pressure and Concentration Calculation

The BHP Tool in DMS is designed to give additional functionality to the treater or engineer. It provides bottom hole related parameters such as BHP and Net Pressure or Packer Differential Pressure and others. It simplifies process of stage related reporting.

The software is able to calculate realistic values for Bottom Hole Pressure and Bottom Hole Concentration values in real-time. It incorporates the real three dimensional appearance of the tubing as well as casing and populate pressure values along the well and different fluids or concentration values running down the well by

showing different colors in a three dimensional tubing diagram. Three dimensional well data can be entered by using a subset of MD, TVD, AZI, NS or EW, depending on the available data for each well. After entering a minimal set of data, the other set is calculated automatically. The three dimensional form can be shown in a preview window to simplify entering data. Casing, tubular and perforation data can be incorporated in order to provide proper friction calculation.

The screenshot shows the 'Job data' window with several tabs: 'Well parameters', 'Pumping schedule', 'Job Properties', and 'Measurement units'. The 'Deviation data' tab is active, showing a table with columns for MD, TVD, INC, AZI, NS, and EW. Below it is a 'Tubular data' section with a table for Top/Bottom (MD), Tubing OD, Tubing weight, and Casing OD. There are also 'Add', 'Remove', and 'Recalculate' buttons. At the bottom, there is a 'Preview' button and an 'Export to WITSML' button.

MD [ft]	TVD [ft]	INC (0..180)*	AZI (0..360)*	NS [ft]	EW [ft]
0	0	0	0	0	0
3280.84	3280.84	0	0	0	0
6561.68	6122.131	30	40	1256.635	1054.442
9842.52	7762.551	60	0	4097.925	1054.442
14763.78	7762.551	90	-10	8944.42	199.874

Top/Bottom (MD) [ft]	Tubing OD [inch]	Tubing weight [lb/ft]	Casing OD [inch]			
0	9842.52	3	2.5	7.587	5.563	4.313
9842.52	11482.94	2.5	1.9	5.799	5.563	4.313
11482.94	14763.78	2	1.6	5.026	5.563	4.313

Zone	Top / Bottom (MD) [ft]	Nr of perf.	Perforation diameter [inch]	Discharge coefficient	
1	13123.36	13287.402	16	0.3	0.65
2	13779.528	13943.57	16	0.3	0.65
3	14435.696	14599.738	16	0.3	0.65

Figure 9: Wellbore/Tubular table

Hydrostatic pressure and friction losses are calculated on the fly depending on a defined pumping schedule that incorporates different fluids and proppants. Fluids and proppants can be selected from a fluids or proppants database. New fluids can be entered by the operator using rheology data (n & K) or pressure loss data for various tubing diameters and flow rates in imperial or metric dimensions such as psi/1000ft or bar/100m and others. The stages table is visualized during the job on a stages screen with a visual marking of the current active stage. The BHP tool can recalculate all data at any time after changing parameters.

Stage	Zone	Stage slurry total / Slurry total		Flow rate	Fluid	Fluid friction calc.		Proppant	Proppant conc: Start / End		Proppant conc. correction				
		bbl(oil)				X _A	X _B		PPA		X _{C1}	X _{C2}	X _{C3}	X _{C4}	X _{C5}
1	17	49.9	49.9	12	StimGel-H17F	1	1	100 Mesh	0	0	1	1	1	1	1
2	17	19.8	69.7	15	StimBor-H35F	1	1	100 Mesh	0	1	1	1	1	1	1
3	17	101.6	171.3	15	StimBor-H35F	1	1	100 Mesh	1	1	1	1	1	1	1
4	17	29.5	200.8	15	StimBor-H35F	1	1	100 Mesh	2	2	1	1	1	1	1
5	17	197.3	398.1	15	StimBor-H35F	1	1	Recycled 12/18 CarboLite G2	3	3	1	1	1	1	1
6	17	102.3	500.4	15	StimBor-H35F	1	1	12/18 CarboLite G2	4	4	1	1	1	1	1
7	17	106.9	607.3	15	StimBor-H35F	1	1	12/18 CarboLite G2	5	5	1	1	1	1	1
8	17	165.2	772.5	15	StimBor-H35F	1	1	12/18 CarboLite G2	6	6	1	1	1	1	1
9	17	114.2	886.7	15	StimBor-H35F	1	1	12/18 CarboLite G2	7	7	1	1	1	1	1
10	17	118.7	1005.4	15	StimBor-H35F	1	1	12/18 CarboLite G2	8	8	1	1	1	1	1
11	17	185.9	1191.3	15	StimBor-H35F	1	1	12/18 CarboLite G2	9	9	1	1	1	1	1
12	17	645.4	1836.7	15	StimBor-H35F	1	1	12/18 CarboLite G2	10	10	1	1	1	1	1
13	17	19.8	1856.5	15	StimBor-H35F	1	1	12/18 CarboLite G2	11	11	1	1	1	1	1
14	17	138.9	1995.4	15	StimBor-H35F	1	1	12/18 CarboLite G2	12	12	1	1	1	1	1

Figure 10: Wellbore/Tubular table

Job depending constants such as surface line volume, initial wellbore filling or closure pressure and others provide a comprehensive and realistic real time view and post job report of the well treatment.

The software provides an easy way of comparing the design versus the real pumped schedule.

The Bottom Hole Pressure and Concentration Tool is not included in the standard DMS editions but it is offered as add-on.

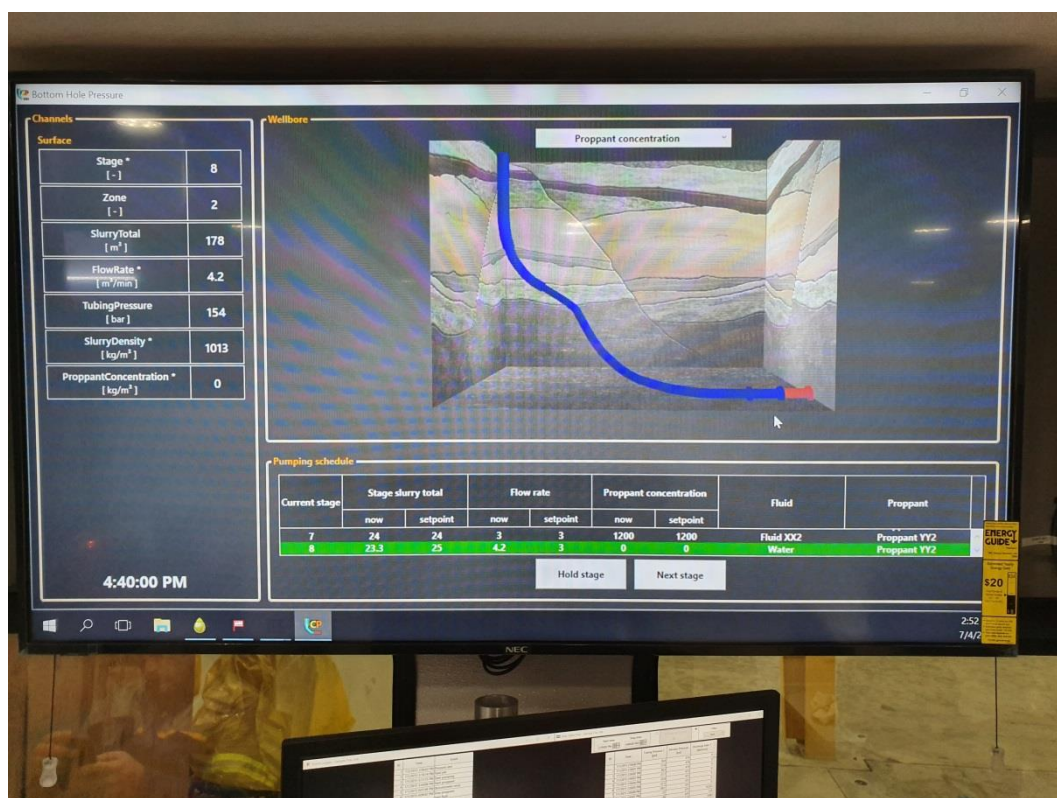


Figure 11: Example 3D wellbore with bottom hole pressure calculation

12 CT-Fatigue

The software provides a real-time but also post-job fatigue analysis for Coiled Tubing for maximizing the safe use of a CT-string and parts of it. It tracks live consumptions under incorporation of pressure, geometry, corrosion factors, welds and other factors. In real-time mode, tri-axial stresses are calculated and visually presented to the operator. The software incorporates widely industry accepted and field proven algorithms.

The CT-Fatigue Tool is not included in the standard DMS editions but it is offered as an add-on.

13 Provided features in DMS Lite

- Realtime recording from multiple units at the same time
- Charts, analog and digital gauges displays
- Fast Reporting tool for local storage incl. CSV export
- Set up acoustic and visual alarms
- Multi screen usage

- Connects to any compatible hardware by TCP (Ethernet/WiFi) or Serial Port

14 Provided features in DMS Pro

- Realtime recording from multiple units at the same time
- Charts, analog and digital gauges displays
- Fast and Advanced Reporting tools with E-mail function incl. CSV export
- Set up acoustic and visual alarms
- Multi screen usage
- Connects to any compatible hardware by TCP (Ethernet/WiFi) or Serial Port
- Logging of events with timestamp to data base
- Detailed Data import/export from/to CSV
- Mathematical functions
- Send ASCII data via Serial Port and TCP

15 System Requirements

Minimum system requirements: Windows 7, 8 or 10, Intel compatible 32 bit or 64 bit CPU, 2 GB RAM, 20 GB free space on hdd or SSD. For reporting, MS Office is needed.

16 Scope of supply

- Software as download link
- Software license

17 Software Impressions

