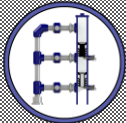
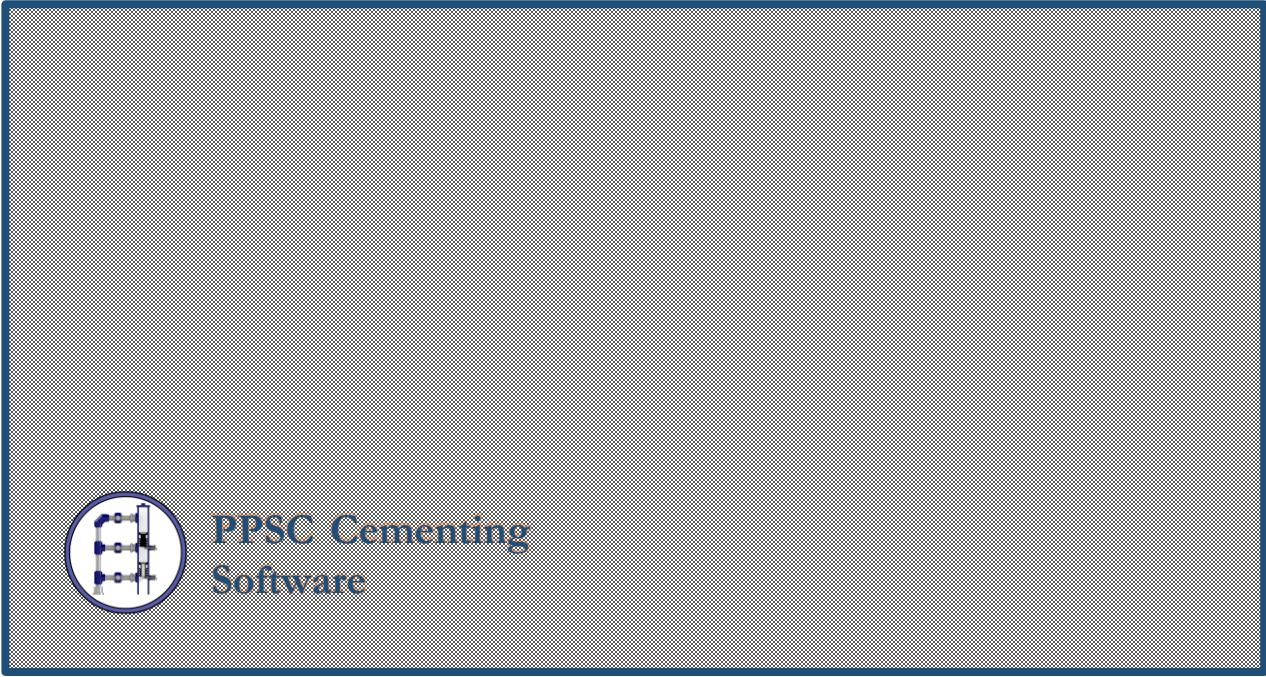


PPSC Cementing Software

Reference Manual

April 2026



PPSC Cementing
Software

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Overview

Cementing is one of the most critical operations in the life cycle of an oil and gas well. It plays a fundamental role in ensuring well integrity, zonal isolation, and long-term production performance. Poor cementing design or execution can lead to severe operational issues such as gas migration, sustained casing pressure, fluid channeling, and ultimately well failure. As drilling environments become more complex, featuring deeper wells, higher pressures and temperatures, and increasingly challenging trajectories, the need for accurate, reliable, and efficient cementing design tools has never been greater.

The **PPSC Cementing Software**, developed by **Permian Petroleum Software Company (PPSC)**, is an advanced engineering platform designed to support the complete workflow of cementing design, simulation, and analysis. The software integrates well geometry, fluid properties, directional survey data, and operational parameters into a unified modeling environment, allowing engineers to design and evaluate cementing jobs with a high degree of accuracy and confidence.

At its core, PPSC Cementing provides a physics-based simulation framework that models fluid displacement inside the wellbore, accounting for complex interactions between drilling mud, spacer fluids, cement slurries, and displacement fluids. The software incorporates industry-standard rheological models such as Bingham Plastic, Power Law, and Herschel Bulkley behavior and uses detailed hydraulic calculations to predict pressure losses, equivalent circulating density (ECD), and pump requirements throughout the cementing operation. These capabilities enable engineers to design jobs that effectively remove drilling fluids, minimize contamination, and ensure proper placement of cement across target zones.

One of the key strengths of the PPSC Cementing Software is its ability to simulate both spatial and temporal evolution of the cementing process. Users can visualize how fluids move within the tubing and annulus over time, monitor pressure changes along the wellbore, and evaluate whether operating conditions remain within safe limits defined by pore pressure and fracture pressure gradients. This dynamic simulation approach helps mitigate risks such as formation breakdown, lost circulation, and influx, which are critical considerations in both conventional and unconventional wells.

In addition to its robust simulation engine, the software offers an intuitive and user-friendly interface that guides engineers through each step of the design process. From defining casing programs and well geometry to configuring multi-stage cement systems and importing directional survey data, the workflow is structured to reflect real-world field operations. The platform also includes comprehensive visualization tools, such as pressure-depth plots, pump pressure versus time charts, and 3D well trajectory displays, enabling users to interpret results quickly and make informed engineering decisions.

The PPSC Cementing Software is designed to serve a wide range of users, including drilling engineers, completion engineers, cementing specialists, and researchers. It is particularly well-suited for applications in the Permian Basin and other complex reservoirs, where precise control of cement placement and pressure management is essential. By combining engineering rigor with computational efficiency, the software enables users to perform rapid scenario analysis, optimize job design, and improve overall operational success.

Ultimately, the goal of PPSC Cementing is to bridge the gap between theoretical modeling and field execution. By providing accurate predictions, clear visualizations, and practical design tools, the software helps ensure that cementing operations are not only technically sound but also operationally efficient and cost-effective. Through its integrated approach, PPSC Cementing contributes to safer wells, improved zonal isolation, and enhanced long-term asset performance.

Home Page

The PPSC Cementing software begins with a secure login interface. Users must enter their email/username and password. Options include “Keep me logged in” and “Forgot Password.” Click “Sign In” to access the system.

From a web browser, enter <https://software.ppscnm.com/login>. A log in page will appear as shown in Fig. 1

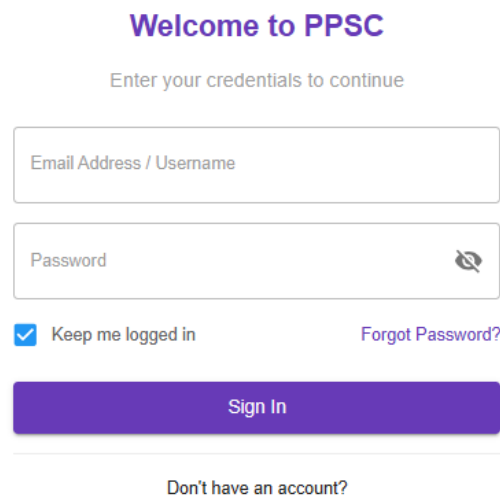




Figure 1 shows the login page for PPSC software. The page features a purple header with the text "Welcome to PPSC". Below the header, the instruction "Enter your credentials to continue" is displayed. The login form consists of two input fields: "Email Address / Username" and "Password". The password field includes a toggle icon for visibility. Below the input fields, there are two options: "Keep me logged in" (checked) and "Forgot Password?". A prominent purple "Sign In" button is centered below these options. At the bottom of the form, there is a link "Don't have an account?".

Figure 1: PPSC software’s log in page

After login, users access the dashboard with modules such as Rod Pump, Cementing Design, Drilling Design, Acid Gas Injection, and Bottomhole Pressure, etc. Select “Cementing Design” to proceed.

Now you can click the icon with three bars on the top left, , to hide the list of software panel.

Account Manager

After login into the Cementing Design Software, on the top right corner, click on the icon, , to open the account manager. There are four options under the account manager: account settings, theme settings, chart settings, and logout as shown in Fig. 2

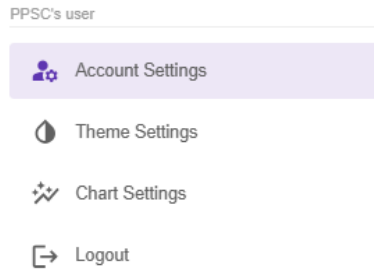


Figure 2: PPSC Software's account manager

Account Settings

The Account Settings tab allows users to view and update their personal and professional information associated with the PPSC platform. Users can make changes on the following: first name, last name, email address, phone number, company, country, and address.

There are four tabs under the account manager: **Account Info** | Software License | Sessions | Change Password :

- **Account Info:** Users can see the information of the registered entity such as name, email, phone number, company, and mailing address.
- **Software License:** Users can see what software is activated and the created date and expiration date.
- **Sections:** This section will show the total number of PPSC's registered software.
- **Change Password:** This section allows users to change password.

Click **Save** to apply changes and click **Reset** to revert unsaved changes

Theme Settings

The Theme Settings interface allows users to customize the visual appearance of the software.

Available Options includes: layout, light mode (default), dark mode.

Users can select from multiple predefined color themes to personalize the interface.

Users can also make changes on font family

Chart Settings

The **Chart Settings** module provides full control over the appearance and readability of engineering plots and simulation outputs. Proper chart configuration enables: Clear interpretation of simulation results, improved identification of pressure trends and anomalies, and High-quality visuals for technical reporting and presentations. This is particularly important for: pressure plots, volume tracking charts, and displacement visualization.

User can make changes on the following on plots: title, legend, x-axis, y-axis. The adjustable parameters include: font family (e.g., sans-serif), font size (via slider), and font style (normal, bold).

Logout

The **Logout** function securely terminates the current session. This function prevents unauthorized access to projects. Users are highly recommended to use this function after completing work, using shared or public computers, and switching users.

Main Window of the PPSC Cementing Software

On the main window, users should see three main sections as shown in Fig. 3. From left to right, the three sections are:

- (1) Section 1 – Project Manager: The project manager allows users to create projects, delete projects, duplicate projects, run projects and clear projects.
- (2) Section 2 – Input: This section allows users to enter all the inputs necessary for the software to run. Typical inputs are casing casing, casing setting depths, casing grade, lead cement, tail cement, spacer, pump rate, slurry rheology, etc.
- (3) Section 3 – Results: this section shows results of fluid volumes, fluid pumping time, cement mixing time, cement weight, number of sacks of cement, percent mix, fluids displacement, pump pressure, ECD vs. time, and 2D and 3D wellbore trajectory.

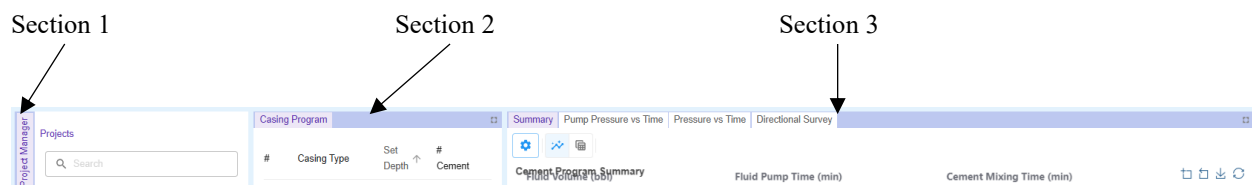


Figure 3: Main window of PPSC Cementing Software

Section 1 - Project Manager

The **Project Creation** module is the starting point for all cementing design workflows in the PPSC Cementing Software. A project serves as a structured container that stores all inputs, simulations, and results associated with a specific well or cementing job.

To create a new project:

1. Navigate to the **Projects** panel
2. Click the **“Create”** button (or **“+”** icon)
3. The **Create Project** dialog will appear
4. Enter a unique and descriptive name for the project. Recommended naming convention: Well Name / Field / Stage. Example: *Well_A_Surface_Cement*
5. Select the unit system for the project. Field unit will be served as default.

Click Submit to creates the project and initializes the workspace. Click Cancel to close the dialog without saving.

To open an existing project, just simply click on the name of the project that you already created in the past. Note that the software will save all the projects that you created for a specific account.

Section 2 - Input

Overview

The **Input Section** of the PPSC Cementing Software is where users define all essential parameters required to perform a cementing simulation. This includes:

- Well geometry (Casing Program)
- Cement job configuration (Cement Program)
- Fluid properties
- Pressure data and directional survey

Accurate input data is critical to ensure reliable simulation results, including pressure prediction, fluid placement, and displacement efficiency.

Casing Input

Add New Casing ✕

General

Casing Type

Open Hole ID Unit

Shoe MD Unit

Casing

[Select Standard Casing](#)

Grade

Outer Diameter Unit

Inner Diameter Unit

Weight Unit

Collapse Pressure Unit

Figure 4: Casing inputs window

The **Casing Program** defines the physical structure of the wellbore, including all casing strings and their corresponding setting depths. This information is essential for calculating annular volumes, determining flow paths, and evaluating frictional pressure losses during the cementing operation.

To add a casing string, users click the “+” icon to open the **Add New Casing** window (see Fig. 4). Within this interface, users first select the appropriate **casing type** (e.g., surface, intermediate, production). Next, users input the **open hole inner diameter (ID)** and the **casing shoe measured depth (MD)**.

For convenience and accuracy, users can then click the “**Select Standard Casing**” option to choose from predefined **API standard casing specifications**. Once selected, the software automatically populates all relevant casing properties, including outer diameter, inner diameter, weight, and grade, ensuring consistency with industry standards and reducing manual input errors.

Cement Input

To add cement program, users click the “+” icon to open the **Add New Cement Program** window (see Fig. 5).

The screenshot shows the 'Add New Cement Program' window. The window title is 'Add New Cement Program'. It features a 'General' tab and a 'Mud' tab. The 'General' tab includes the following fields: Name, Description, Casing Selection (dropdown menu), Stage # (1), Designed MD (0), and Unit (ft). The 'Mud' tab includes the following fields: Mud Density (8.34), Unit (ppg), Fluid Model (Bingham Plastic), Bingham Plastic Viscosity (5), Unit (cp), Yield Point (5), and Unit (lb/100ft²). At the bottom right of the window are 'Cancel' and 'Submit' buttons.

Figure 5: Cement input program window

In the **General** section, enter the name and a brief description of the cement slurry. From the **Casing Selection** drop-down menu, choose the casing string to be cemented. Next, specify the number of cementing stages (e.g., 1, 2, or 3). The designed measured depth (MD) should match the MD of the selected casing.

In the **Fluids** section, five fluid types are available: drilling mud, spacer, lead cement, tail cement, and displacement fluid.

For good displacement, the fluids densities are recommended as follows: $\rho_{cement} > \rho_{spacer} > \rho_{mud}$

Mud

Users define the drilling mud present in the wellbore prior to pumping the cement slurry. Required inputs include the mud density and the fluid model, which may be selected from Bingham Plastic, Newtonian, Power Law, or Herschel–Bulkley. Based on the selected fluid model, users must enter the corresponding rheological properties accordingly.

Spacer

For the **Spacer** section, ensure that the **Active Status** toggle is turned on to include this fluid in the simulation.

Users define the spacer properties prior to cement placement. In the **Input Option**, select the desired input method (e.g., Volume). Enter the spacer **Volume** (e.g., 60 bbl) and the **Flow Rate** (e.g., 5 bpm). Specify the **Spacer Density** (e.g., 9.0 ppg).

Next, choose the **Fluid Model** from the available options (e.g., Bingham Plastic). Based on the selected model, input the required rheological parameters. For the Bingham Plastic model, users must provide the **Plastic Viscosity** (e.g., 5 cP) and **Yield Point** (e.g., 5 lbf/100 ft²). Ensure all units are consistent with the selected unit system.

Lead Cement

For the **Lead Cement** section, ensure that the **Active Status** toggle is turned on to include this fluid in the simulation.

In the **Input Option**, select how the lead cement will be defined (e.g., Top). Enter the **Top depth** (e.g., 0 ft) and specify the **Flow Rate** (e.g., 5 bpm). Provide the **Cement Density** (e.g., 12.5 ppg).

Next, choose the **Fluid Model** (e.g., Bingham Plastic). Based on the selected model, input the required rheological properties. For the Bingham Plastic model, enter the **Plastic Viscosity** (e.g., 100 cP) and **Yield Point** (e.g., 10 lbf/100 ft²). Ensure all units are consistent with the selected unit system.

Tail Cement

For the **Tail Cement** section, ensure that the **Active Status** toggle is turned on to include this stage in the simulation.

In the **Input Option**, select **Top**, then enter the **Top depth** (e.g., 3000 ft). Specify the **Flow Rate** (e.g., 3 bpm) and the **Cement Density** (e.g., 12.5 ppg).

Next, choose the **Fluid Model** (e.g., Bingham Plastic). Based on the selected model, input the required rheological properties. For the Bingham Plastic model, enter the **Plastic Viscosity** (e.g.,

100 cP) and **Yield Point** (e.g., 10 lbf/100 ft²). Ensure all inputs are consistent with the selected unit system.

Displacement

For the **Displacement Fluid**, select the **Volume Option** as **Auto**, allowing the system to automatically calculate the required volume. Enter the **Flow Rate** (e.g., 3 bpm) and specify the **Fluid Density** (e.g., 15.8 ppg).

Next, choose the **Fluid Model** (e.g., Bingham Plastic). Based on the selected model, input the required rheological properties. For the Bingham Plastic model, enter the **Plastic Viscosity** (e.g., 50 cP) and **Yield Point** (e.g., 10 lbf/100 ft²). Ensure all inputs are consistent with the selected unit system.

After completing all required inputs, click the **Submit** button to proceed.

Section 3 - Results

Overview

The Results section provides a comprehensive visualization and analysis of the cementing simulation. It is organized into multiple tabs, including Summary, Pump Pressure vs Time, Pressure vs Time, and Directional Survey, each offering specific insights into the operation.

The Summary tab presents key output parameters and overall job performance, allowing users to quickly assess the effectiveness of the cementing design. The Pump Pressure vs Time and Pressure vs Time tabs display graphical representations of pressure behavior throughout the pumping process, helping users evaluate pressure trends, identify potential risks, and verify that operational limits are not exceeded. The Directional Survey tab illustrates the well trajectory, providing spatial context for the simulation.

Together, these result views enable users to validate the cementing design, optimize parameters, and ensure safe and efficient execution of the operation.

Summary

The **Summary** tab presents a graphical overview of the cementing program through a series of charts that highlight key operational parameters for each cement stage (e.g., Cement #1, Cement #2, and Cement #3) as shown in Fig. 6. These visualizations allow users to quickly compare and evaluate the performance and design of each stage.

The **Fluid Volume (bbl)** chart shows the distribution of all fluids including spacer, lead cement, tail cement, and displacement fluid, used in each stage. The **Fluid Pump Time (min)** chart illustrates the time required to pump each fluid, helping users assess operational efficiency and scheduling. The **Cement Mixing Time (min)** chart provides the estimated time needed to prepare cement slurries before pumping. This information is used to obtain the thickening time.

Additional charts include **Cement Weight (lb)** and **Cement Volume (sk)**, which quantify the total material requirements for each stage, and **Percent Water (%)**, which indicates the water content of the cement slurries. Together, these plots provide a comprehensive summary of fluid usage, timing, and material properties, enabling users to validate the cementing design and make informed adjustments if needed.

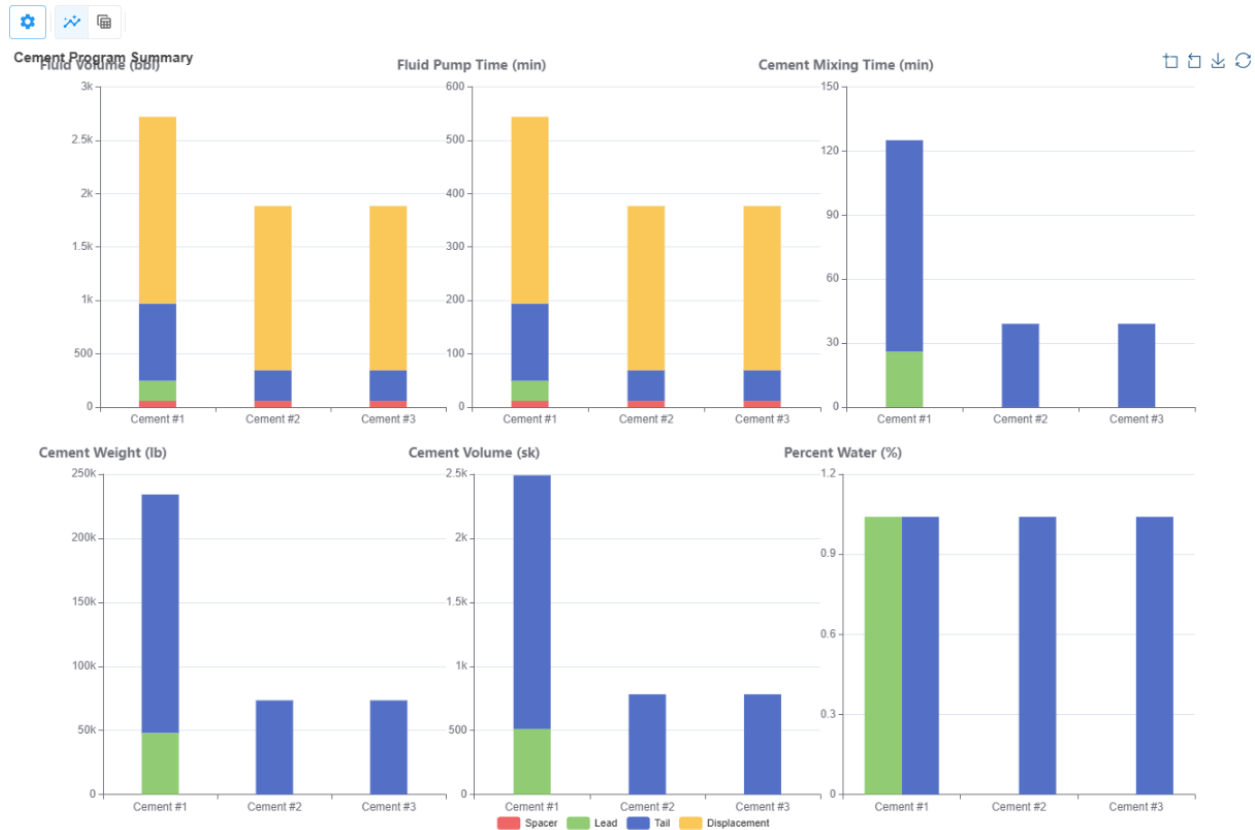




Figure 6: Summary charts of the cementing design

When the **Settings** icon, , is clicked, the **Edit Table Unit** window appears. This interface allows users to review and modify the units and values associated with the cementing results table.

The table displays detailed information for each casing and cement stage, including Casing Type, Cement ID, Stage, Fluid Type, Flow Rate, Volume, Pumping Time, Density, and fluid placement depths (top and bottom). It also includes calculated outputs such as Fluid Weight, Dry Cement Weight, and Cement Volume (sk).

Users can adjust units directly within the table (e.g., bpm, bbl, ppg, ft, lb) using the drop-down options provided in each column header. This flexibility allows users to customize the data presentation according to their preferred unit system and facilitates easier interpretation, reporting, and export of simulation results.

When the **Table** icon, , is clicked, a detailed results table is displayed. This table provides a comprehensive breakdown of the cementing operation for each casing string and stage, including all fluid types such as spacer, lead cement, tail cement, and displacement fluid.

The table includes key parameters such as Flow Rate, Volume, Pumping Time, Density, Top and Bottom Depths, Fluid Weight, Dry Cement Weight, Cement Volume (sk), Water Percentage, and Mixing Time. This detailed view allows users to thoroughly review fluid placement, material requirements, and operational timing for each stage.

Additionally, this window allows users to download the table in csv file for further analysis, reporting, or documentation purposes.

Pump Pressure vs. Time

When the **Pump Pressure vs. Time** tab is selected, a comprehensive set of plots is displayed to illustrate fluid movement, pressure behavior, and pumping performance throughout the cementing operation as shown in Fig. 7.

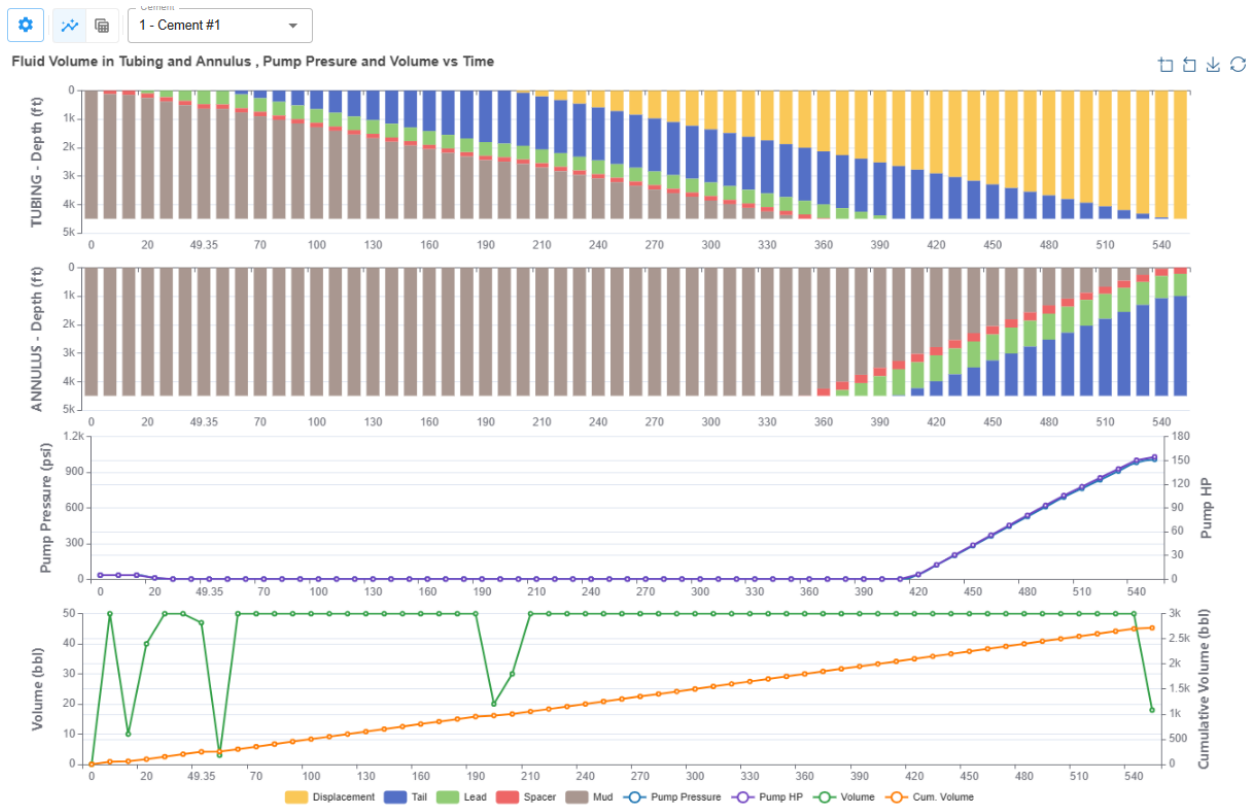


Figure 7: Fluid movement, pressure behavior and pumping performance



The top two panels show the fluid distribution in the tubing and annulus versus depth over time. Each vertical bar represents a time step, with different colors indicating fluid types such as drilling mud, spacer, lead cement, tail cement, and displacement fluid. In the tubing, fluids are progressively pumped downward, with displacement fluid eventually occupying the upper portion. In the annulus, fluids move upward as the cement displaces the drilling mud, clearly showing the transition from mud to spacer and then to cement slurries. These plots allow users to track fluid interfaces and verify proper placement along the wellbore.

The third panel presents pump pressure (psi) and pump horsepower (HP) versus time. Initially, the pump pressure remains low and relatively stable, reflecting minimal resistance during early pumping stages. As the operation progresses, particularly when higher-viscosity cement slurries and displacement fluid are pumped deeper into the well, the pressure increases steadily. The pump horsepower follows a similar trend, rising as more energy is required to maintain the flow under increasing pressure conditions. This plot is critical for ensuring that pressure limits are not exceeded and that equipment capacity is sufficient.

The bottom panel displays instantaneous flow volume (bbl) and cumulative pumped volume (bbl) over time. The instantaneous volume (green line) reflects the pumping schedule and flow rate variations, while the cumulative volume (orange line) increases continuously, representing the

total fluid pumped during the operation. This helps users confirm that the required volumes are delivered as planned and aligns with the designed pumping sequence.

Overall, this tab provides a detailed, time-based visualization of fluid displacement, pressure evolution, and pumping performance, enabling users to validate the cementing design, identify potential risks, and optimize operational parameters.

As with other sections, users can click the **Settings** icon, , to review and modify the units and values associated with the cementing results table. In addition, clicking the **Table** icon, , allows users to download the table as a CSV file for further analysis, reporting, or documentation purposes.

Pressure vs Time

When the **Pressure vs. Time** tab is selected, an interactive visualization is displayed that combines fluid placement and pressure profiles along the wellbore at a specific time step. Users can navigate through time using the slider at the top, which updates the plots dynamically as shown in Fig. 8.

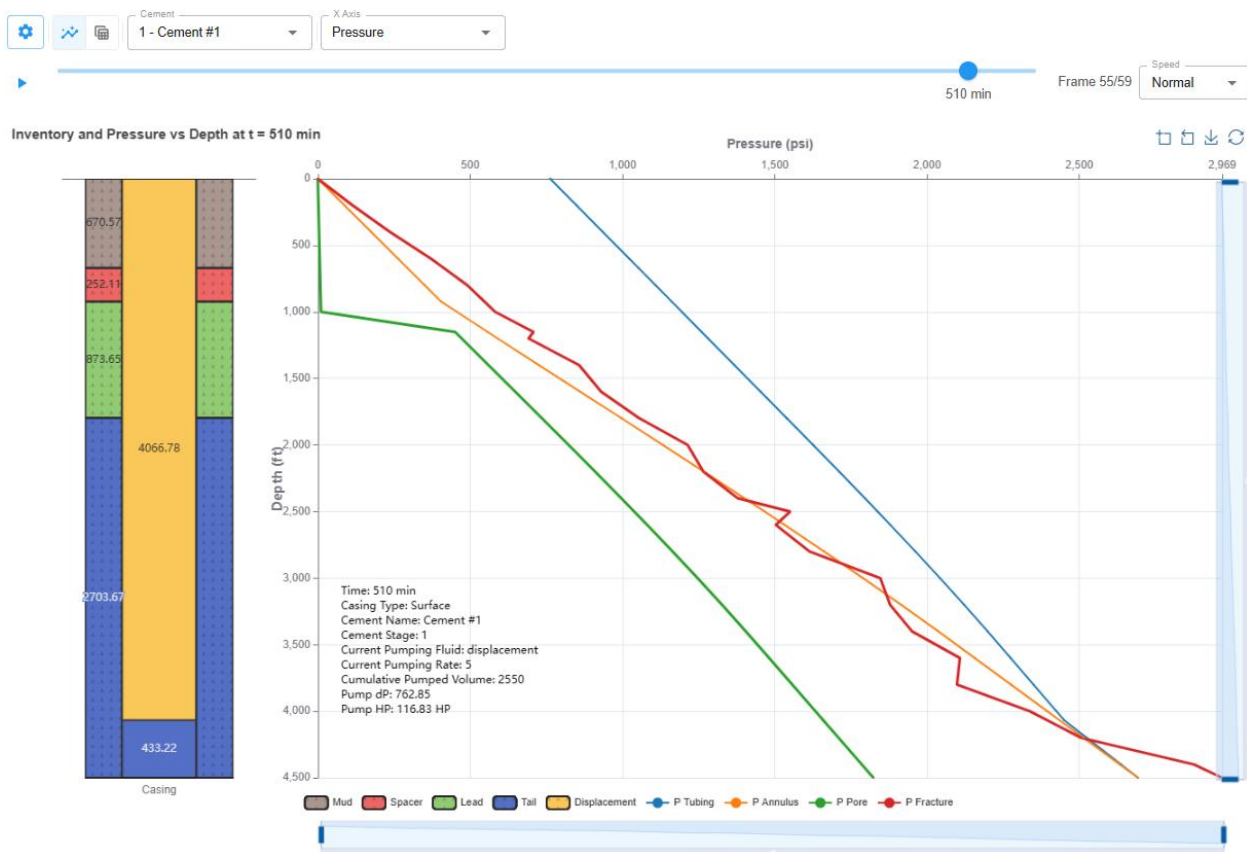


Figure 8: Fluid placement and pressure profiles along the wellbore at different time steps

On the left side, a wellbore schematic illustrates the distribution of fluids inside the casing and annulus. Different colors represent each fluid type: mud, spacer, lead cement, tail cement, and displacement fluid, allowing users to clearly observe fluid interfaces and verify proper placement at the selected time.



The main plot on the right shows pressure versus depth (ft). Multiple pressure curves are displayed, including:

- Tubing Pressure (P Tubing)
- Annulus Pressure (P Annulus)
- Pore Pressure (P Pore)
- Fracture Pressure (P Fracture)

These curves provide critical insight into downhole pressure conditions. The tubing and annulus pressure profiles reflect the hydraulic response during pumping, while the pore and fracture pressure lines define the safe operating window. By comparing these curves, users can assess whether the operation remains within safe limits—avoiding formation influx (pressure below pore pressure) or formation breakdown (pressure exceeding fracture pressure).

Additional details for the selected time step are displayed within the plot, including casing type, cement stage, current pumping fluid, pumping rate, cumulative pumped volume, pump differential pressure, and pump horsepower. These parameters help users understand the operational state at that moment.

Overall, this tab provides a time-resolved evaluation of pressure behavior and fluid placement, enabling users to monitor wellbore integrity, validate the cementing design, and ensure that pressures remain within the allowable operating envelope throughout the job.

As with other sections, users can click the **Settings** icon, , to review and modify the units and values associated with the cementing results table. In addition, clicking the **Table** icon, , allows users to download the table as a CSV file for further analysis, reporting, or documentation purposes.

Directional Survey

When the **Directional Survey** tab is selected, a 2D or 3D visualization of the well trajectory is displayed as shown in Fig. 9. This plot illustrates the spatial path of the wellbore from the surface to the total depth, providing a clear understanding of the well geometry.

The trajectory is plotted in three dimensions using **True Vertical Depth (TVD)** on the vertical axis and **horizontal displacement** along the **East–West** and **North–South** directions on the horizontal axes. This allows users to observe both the vertical and lateral deviation of the well.

The well path is color-coded based on the selected parameter (e.g., **Inclination**), as indicated by the color scale on the left. Lower inclination sections near the surface are typically shown in cooler colors (blue), while higher inclination or horizontal sections are represented by warmer colors (yellow to red). This helps users quickly identify changes in well deviation and the transition from vertical to directional or horizontal drilling.

The plot shows a gradual build section followed by a highly deviated or horizontal segment at greater depths, indicating a typical directional well profile. Users can interact with the visualization (rotate, zoom, and pan) to examine the trajectory from different angles and better understand well placement.

Overall, this section provides essential spatial context for the cementing simulation, helping users evaluate how well geometry may impact fluid placement, pressure distribution, and overall job performance.

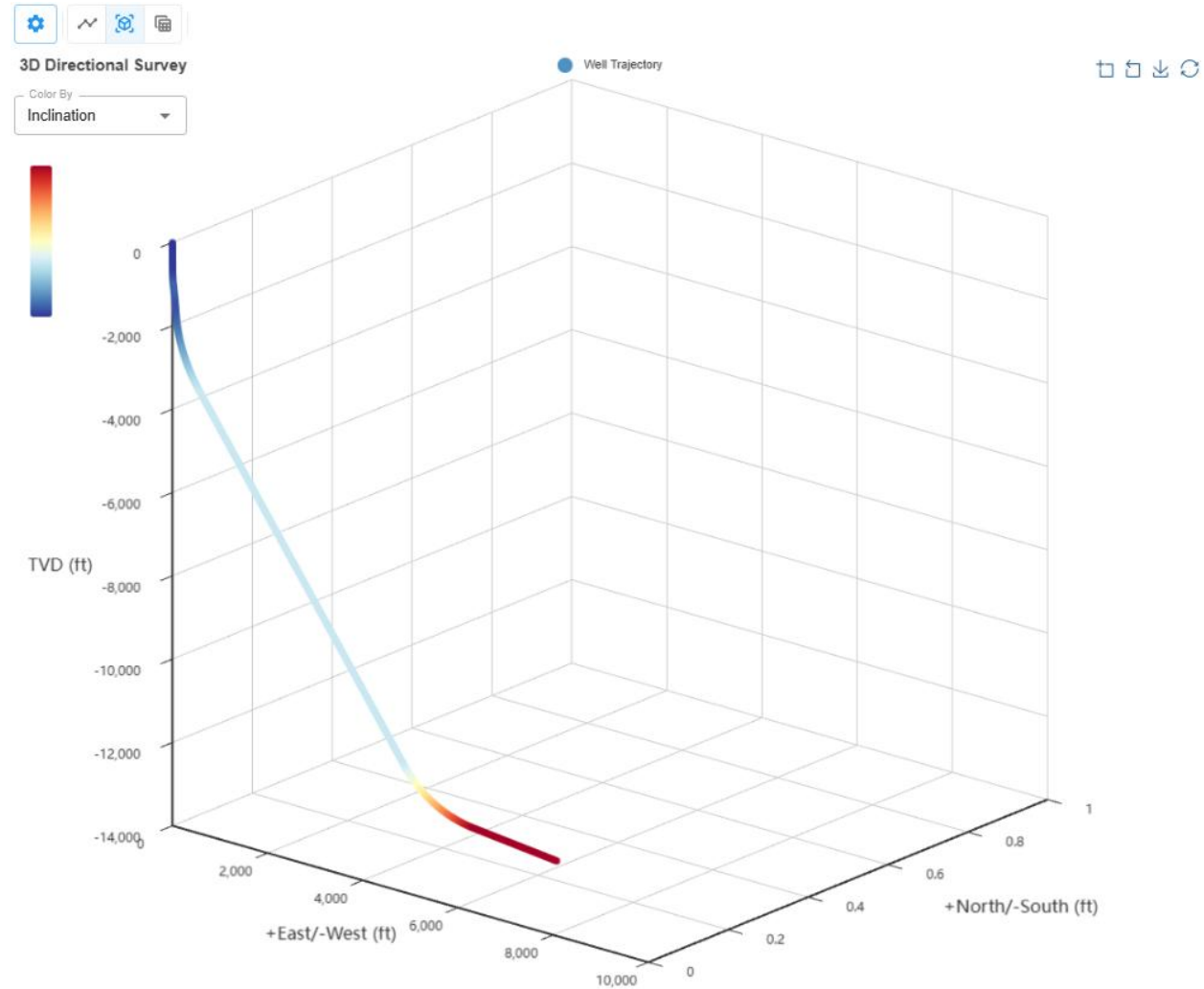


Figure 9: 3D wellbore trajectory

Contact

For more information, technical support, or inquiries about the PPSC Cementing Software, please contact us:

Website: <https://ppscnm.com>

Email: ppsc@ppscnm.com

Our team is available to assist with questions, software demonstrations, and technical support.

