Pegasus Vertex, Inc.

Drilling Software | Sophisticated Yet Simple

WHITE PAPER

A Sophisticated Engineering Toolbox in a Simple App

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I. Introduction

When the first pocket size calculator was invented during the 1960's, everyone's mind was blown. People were now able to carry their own calculators everywhere with them and pull it out of their pockets or purses when it was necessary. This opened the way for companies around the world to innovate the creation of these calculators and with the aid of new technology, today we have mobile devices that fit in our pockets with more computing power than the fridge-sized computers of those days. Although the oil and gas industry has highly benefited from the use of portable calculators, it has encountered a setback.

II. Problem

Every drilling engineer and technician knows that performing drilling engineering calculations can be a tedious and time-consuming process, considering the many researches they have to do in order to find the right results. At times, even these results are not quite exact. While technology has tremendously driven the oil and gas industry forward with the creation and development of advanced software, most of the time these are meant to be used in the office and are not so simple.

III. Solution

To assist with this issue, Pegasus Vertex, Inc.(PVI) has launched the Dr. DE^{Lite} mobile app for both Android and Apple devices. (Figure 1) This free app was developed to provide drilling engineers and technicians with a simple, useful, paperless and portable tool to make their drilling engineering calculations easier and faster.

Figure 1: Dr. DE^{Lite} mobile app

IV. Description

With a great layout for fast and easy calculations, the Dr. DE^{Lite} app is equipped with 30 functions that are divided into 11 groups. (Figure 2)

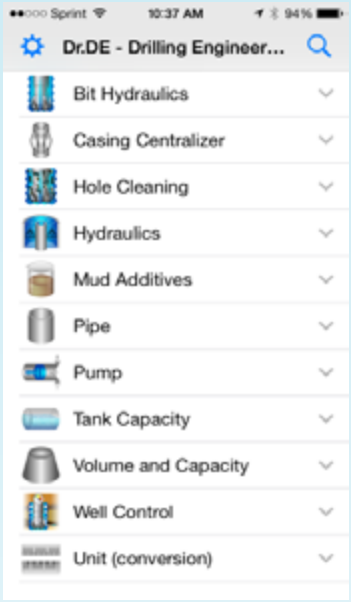

Figure 2: 30 functions in 11 Groups

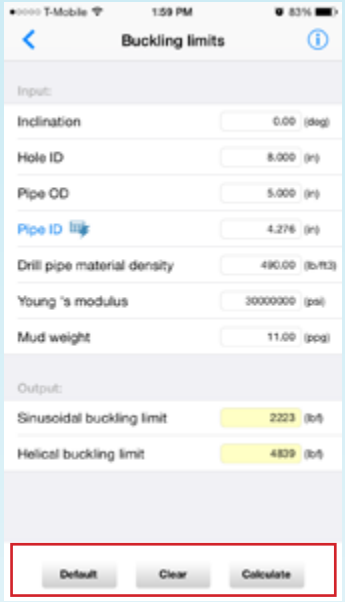

Figure 3: Default/Clear/Calculate

From this great selection of functions, this tool can help you save time and effort to get the calculations you need. In the past, drilling engineers and technicians had to obtain the information from different sources and after gathering the information manually, perform the calculations and that could take up to an hour. However, now the calculations can be done in a matter of seconds and the results are precise.

Dr. DE^{Lite} has a graphical user interface with different resolutions and vertical and horizontal view.

In this new app, every function comes with three main buttons: Default, Clear and Calculate. (Figure 3) The “Default” button gives users an example of standard input data. The “Clear” button allows users to delete all input data and the “Calculate” button performs the calculations based on the data users enter.

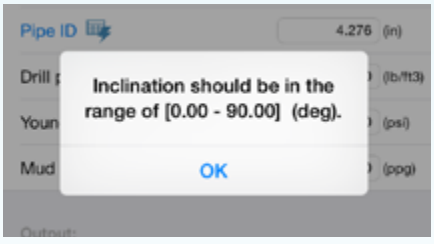

Figure 4: Warning Message

The app collects all the information the users provide and in case the wrong data is entered, it will give a message as a warning. (Figure 4)

There are two icons at the top of the main menu: Options(Left Icon) and Search(Right Icon). (Figure 5)

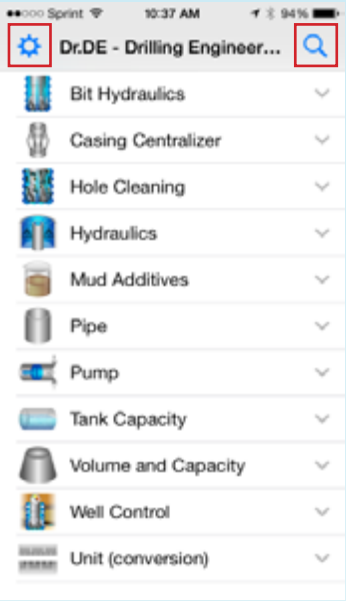

Figure 5: Options and Search

1. Options

This function takes users to a new window where they will have 5 options:

(1) Unit – This section is to setup the unit system that will be used for the app.

(2) Disclaimer – This section displays PVI's disclaimer.

(3) PVI Software – This section displays all of PVI's products. When users click on one of the products, they will automatically be taken to the product's description. There, users will be able to get more detailed information on the product.

(4) About PVI – This section displays a short biography about PVI

(5) Version – This section displays the latest version of Dr. DE^{Lite}.

2. Search

This function allows users to search for a specific function, either by typing the name or a keyword.

V. Main Functions

Dr. DE^{Lite}'s main functions include:

(1) Bit Hydraulics

(2) Casing Centralizer

(3) Hole Cleaning

(4) Hydraulics

(5) Mud Additives

(6) Pipe

(7) Pump

(8) Tank Capacity

(9) Volume and Capacity

(10) Well Control

(11) Unit Conversion

Group Name	Function Name
(1) Bit Hydraulics	• Nozzle area - This function calculates the nozzle area, or total flow area from individual nozzle sizes. • Bit hydraulics - This function calculates the bit hydraulics for a specified bit, hole size and mud information.
(2) Casing Centralizer	• Clearance - Given standoff - This function calculates the annular clearance when casing standoff is given.
(3) Hole Cleaning	• Slip velocity - This function calculates the cutting slip velocity using Chien correlation. Because of slip velocity, cuttings travel toward surface at different rate than fluid. The particle velocity relative to the surface is called the transport velocity. The cutting transport ratio is defined as the transport velocity divided by the mean annular velocity. • Carrying capacity index (CCI) - This function predicts the carrying capacity of mud and resulting hole cleanness.
(4) Hydraulics	• ECD - This function calculates the ECD at depth. • Hydrostatic pressure - This function calculates the hydrostatic pressure of a mud column in a deviated well. • Pressure drop (Bingham) annulus - This function calculates the pressure drop in an annular section for a Bingham plastic fluid. • Pressure drop (Power law) annulus - This function calculates the pressure drop in an annular section for a power-law fluid. • Mechanical specific energy - This function calculates the energy required to remove a unit of rock.
(5) Mud Additives	• Density of oil/water mixture - This function calculates the density of oil and water mixture. • Final density and volume - This function calculates the final density and volume of the mixture of two different fluids. • Number of sacks required - This function calculates the number of sacks required to increase mud weight with barite, calcium carbonate or hematite. • Mud density control - This function calculates the weight of additive and volume of water required to achieve a new mud density.

(6) Pipe	• Buckling limits - This function calculates the sinusoidal and helical buckling limits of a pipe in a vertical or deviated hole. • Pressure, tensile and torsional limits - This function calculates the collapse, burst, tensile and torsional of a pipe. • Buoyed weight in one fluid - This function calculates the ipe weight in one fluid.
(7) Pump	• Duplex – This function calculates the pump output and flow rate for a duplex pump. • Triplex – This function calculates the pump output and flow rate for a triplex pump.
(8) Tank Capacity	• Horizontal tank (Flat heads) – This function calculates the tank and fluid volumes for a horizontal cylindrical tank with flat heads. • Horizontal tank – This function calculates the tank and fluid volumes for a horizontal cylindrical tank with end caps. • Vertical tank (Flat bottoms) – This function calculates the tank and fluid volumes for a vertical cylindrical tank with flat bottoms. • Vertical tank – This function calculates the tank and fluid volumes for a vertical cylindrical tank with end caps. • Rectangular tank (Flat bottoms) – This function calculates the tank and fluid volumes for a rectangular tank with flat bottoms. • Rectangular tank (Sloping sides) – This function calculates the tank and fluid volumes for a rectangular tank with sloping sides.
(9) Volume & Capacity	• Pipe displacement - This function calculates the capacity and volume of the pipe displacement. • Annular capacity - This function calculates the annular capacity and volume for a hole with up to 2 pipes inside. • Pipe and annular volumes - This function calculates various capacities and volumes for a wellbore with a pipe inside.
(10) Well Control	• Mud weight required – This function calculates the formation pressure at kick zone and the mud weight required in order to bring the well under control.
(11) Unit Conversion	• This function enables the conversion between two different units (measure, weight, degree, etc.)

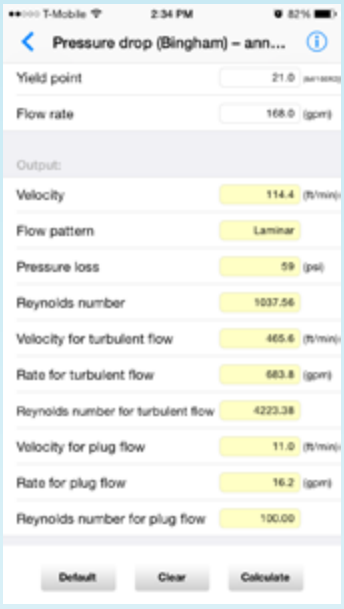

Figure 6: "Pressure Drop" function

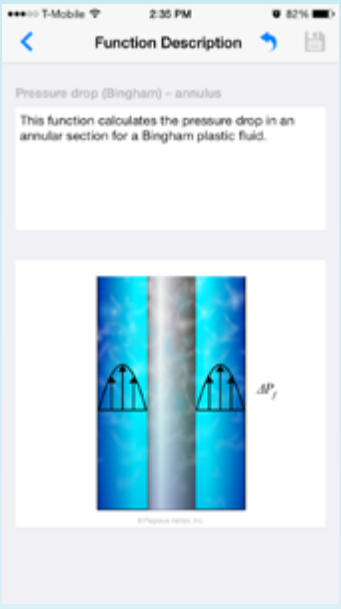

Figure 7: Brief description and illustration

Let's take as an example the "Pressure drop" function. (Figure 6) In the "Pressure drop" function, users can specify the wellbore configuration, as well as fluid properties and flow rates. DR. DE^{Lite} performs calculations for fluid velocity, flow pattern, pressure drop, Reynolds number and other key parameters for different flow patterns.

Every function in the app comes with a brief description and an illustration as it shows in the figure 7.

VI. Conclusion

PVI recognizes the need of adding some of the industry's desired functions into a mobile app that manages elaborated technological solutions. The Dr. DE^{Lite} app is the perfect tool that complements your work. It's easy to download, easy to use, very convenient and free. To download Dr. DE^{Lite} at no charge, scan the QR code or download the app from your mobile play store.

If you are interested in a more remarkably advanced drilling engineering toolbox, PVI highly recommends Dr. DE's stand-alone version or web-based version. For more information on Dr. DE, please contact PVI at:

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