Handheld PC "tools" can speed drilling calculations

Tom Williams, Maurer Technology Inc

A HANDHELD COMPUTER about the size of a folded wallet offers oilfield operators, engineers, planners, and technicians the ability to make complex calculations in seconds, using more than 100 of the industry's leading drilling calculation tools.

The software within the "pocket PC" is a collection of "tools" developed over a 24-year period by **Maurer Technology Inc** of Houston. The package, called DRILLER'S TOOLKIT™ for Pocket PC, includes four major drilling-engineering categories and 18 subcategories that require calculations.

Major categories are drilling mechanics, drilling hydraulics, drilling and completion and directional drilling. Table 1 lists the calculations made by the toolkit.

The toolkit has been available for some time for installation on personal computers and over the Internet. Recent introduction of the newest generation of powerful palm-sized PCs has provided the opportunity to load the entire toolkit on the miniature PC.

The pocket PC is becoming a powerful tool for the oil and gas industry, allowing engineers to literally "take their offices to the field." It provides the convenience of e-mail, calendar, contacts, word processing, and spreadsheet processing.

Figure 1 shows the **Compaq Computer Corp** iPAQtm Pocket PC.

OPERATION

Users access the toolkit by pressing the display screen with a stylus or other object. No keyboard is necessary, and users can operate the computer in almost any environment without removing gloves or other protective gear. Figure 1 illustrates operation of the PC with a stylus. The operator selects the desired tool from the menu by tapping it with the stylus.

In this case, the operator has chosen Tool No. 80, the 2-D Plan/Simple Tangent, which is under the "Survey/Well Path" category (Table 1). To input well-parameter data, the operator (1) double-taps the appropriate box to access a number keypad that is laid out in the format used on handheld calculators, (2) enters the data on the keypad, then (3) taps "OK" to export the entry to the current parameter box. When all parameters are entered, the operator taps the "calculate" button, then views results.

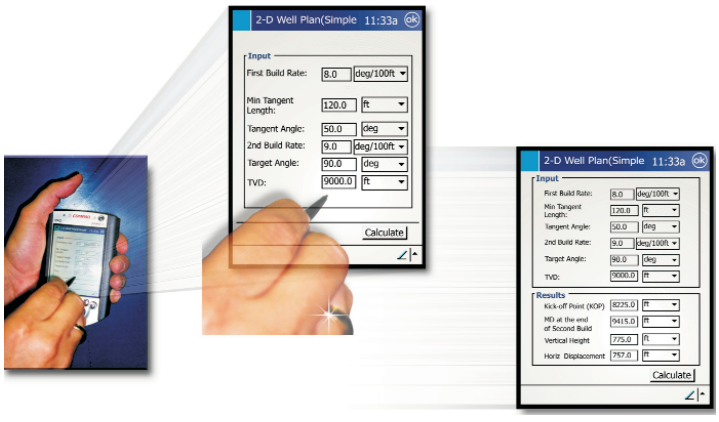

Figure 1: Toolkit user selects tool, inputs data, and receives results. The Driller's Toolkit includes 4 major drilling-engineering categories and 18 subcategories.

Numerical data can also be entered on an alphanumeric panel (using the stylus) or on a sketch panel; both methods are accessed on the screen. The sketch panel allows data entry by using a stylus to write characters directly onto the screen. The Favorites menu can list up to 10 often-used tools that can be accessed with a single tap of the stylus.

FIELD USE

Over 20 pocket PC toolkits are in field use. Some of Maurer's clients are assisting in the development by "beta testing" the toolkit; many improvements recommended by users have been incorporated into the current model. Initial reports from the field reveal that the toolkit is useful to drilling engineers, well planners and drillers. Users have found the toolkit calculations to be great time savers with a high degree of accuracy.

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Table 1: Driller's Toolkit Tools

Bottom Hole Assembly
1 Drill Collar Length
2 Drill Collar Stiffness
3 Drill Collar Weight
4 Drill Weight Planner
5 Min. Drill Collar Length
6 Partial WOB
7 Tapered Drill Collar

Casing Design
8 Casing Basics
9 Casing Burst
10 Casing Collapse Pressure
11 Min. Conductor Depth

Cement
12 Additive Calculator
13 Additive Required
14 Balanced Cement Plug
15 Basic Cement
16 Casing Lifting
17 Weighted Slurry
18 Permeability
19 Slurry Consistency
20 Weighting Material
21 Lightweight Additive

Cost Models
22 Footage Cost (Complex)
23 Footage Cost (Simple)

Drilling Mechanics
24 Average ROP
25 d-Exponent
26 Drillability Equation
27 Instantaneous ROP
28 Max. Drilling Rate
29 Min. Flow Rate–PDC Bit
30 Rock Failure Properties
31 Tooth Wear

Drillstring Mechanics
32 Properties of Drill Pipe
33 Buoyancy Factor
34 Buoyed String Weight
35 Critical RPM
36 Differential Sticking
37 Drillstring Design
38 Free Point
39 Ton-Miles
40 Washout Depth

Hole Cleaning
41 Cuttings Slip Velocity
42 Full Transport of Cuttings
43 Mud Weight in Annulus
44 Rate of Cuttings Addition
45 Mud Solids

Hydraulics I
46 Break Circulation
47 ECD
48 Fluid Velocity
49 Friction Pressure
50 Optimized Hydraulics
51 Pump Output
52 Pump Pressure
53 Surge/Swab Pressure

Hydraulics II
54 Annular Pressure Loss
55 Chokeline Press. Loss
56 Drillstring Pressure Loss
57 Pressure Loss
58 Press. Loss thru Pipe Fittings
59 Press. Gradient for Fluids
60 Surface Equip. Press. Loss

Hydrostatic Pressure
61 Hydro. Press./Complex Col.
62 Hydro Press./Gas Columns
63 Hydrostatic Pressure
64 Press. at Drillstring Bottom

Mud Mixing
65 Add Oil/Water
66 Barite Needed
67 Mud Dilution
68 Mud Mixture
69 Oil/Water Ratio
70 Starting Mud Volume
71 Tank Volume

Mud Rheology
72 Annular Rheology
73 Critical Velocity
74 Fann Viscometer
75 Flow Models
76 Reynolds Number
77 Viscometer Calculator

Pore Pressure
78 Pore Pressure

Survey/Well Path
79 2-D Plan/Complex Tangent
80 2-D Plan/Simple Tangent
81 Directional Survey
82 Dogleg Severity
83 TVD
84 Well Plan
85 Wellbore Departure

Torque/Drag/Buckling
86 Buckling
87 Torque and Drag
88 Torque Available at Drill Bit

Well Control
89 Blowout Preventer
90 Kick Tolerance
91 Kill Mud Weight
92 Kill Sheet
93 Maximum Allowable SICP

Wellbore Stability
94 Fracture Gradient–Offshore
95 Fracture Gradient–Onshore
96 Leak-Off Test
97 Lost Circulation Mud Weight
98 Mud Weight in Inclined Hole
99 Normal Formation Pressure

Utilities
100 Unit Conversion
101 Calculate Volume