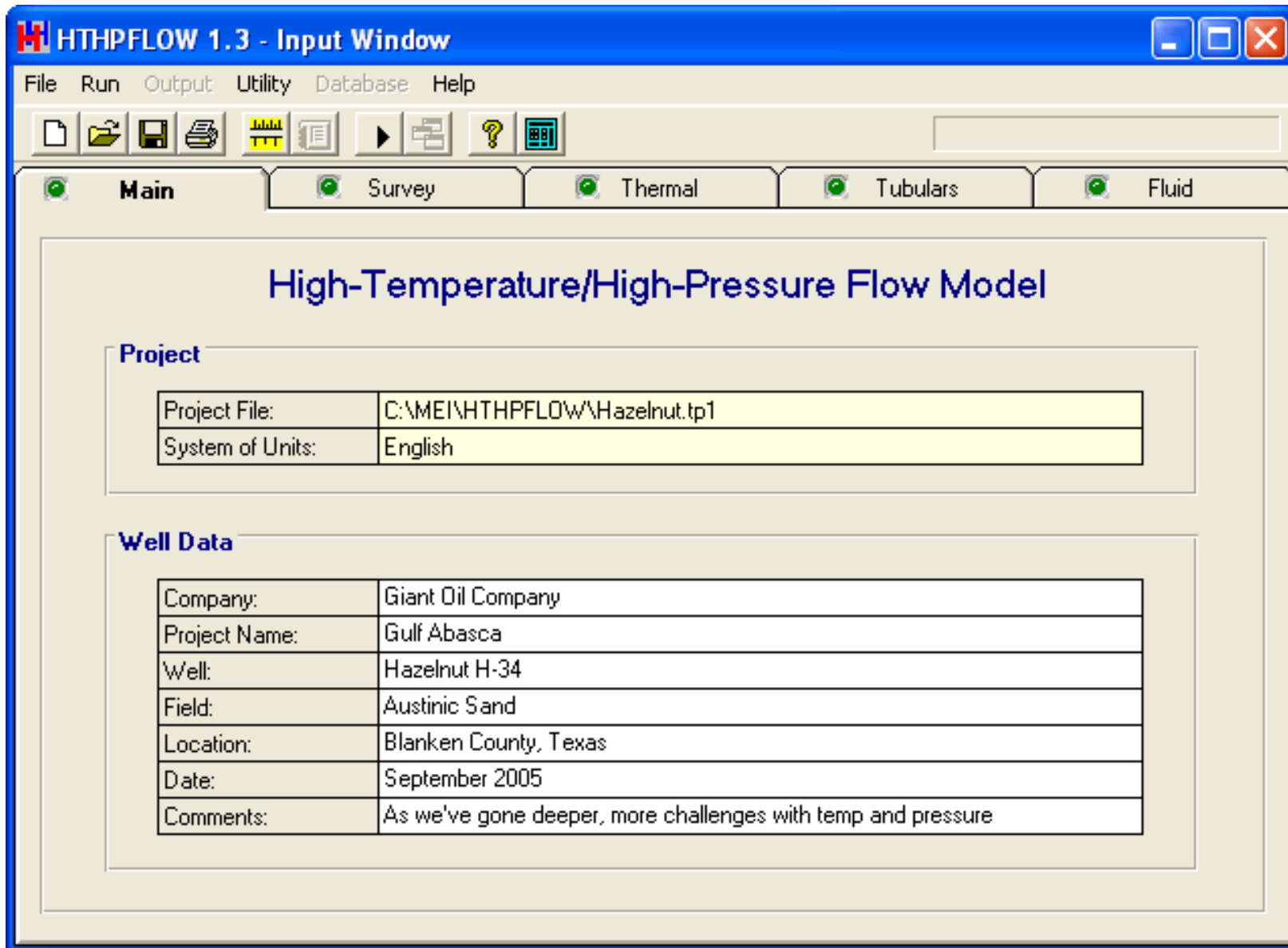


HTHPFLOW – High-Temperature/ High-Pressure Flow Model

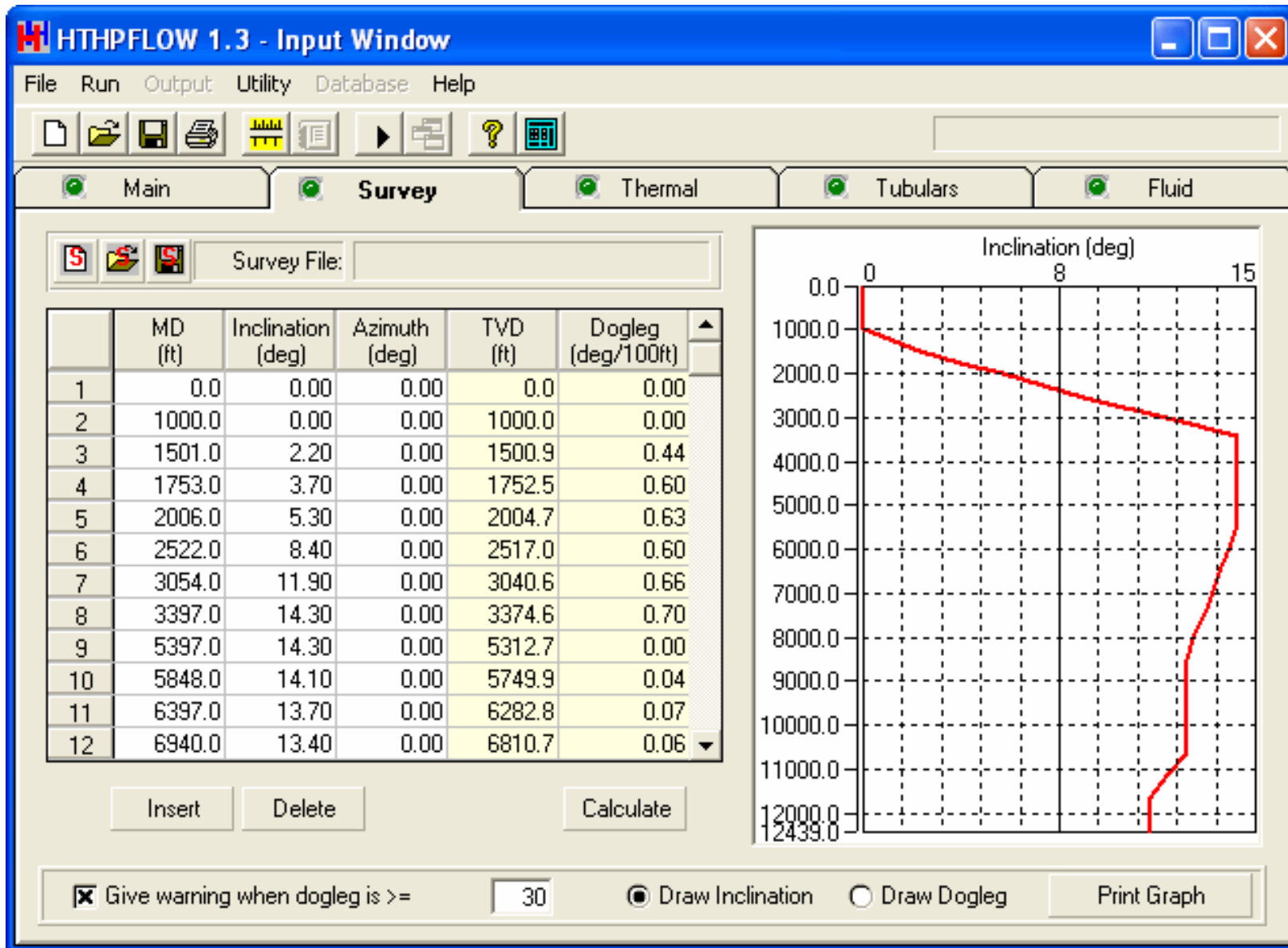
HTHPFLOW was developed by MTI to address the industry's need for detailed analysis of wellbore hydraulics and **improved drilling operations for high-temperature/high-pressure wells**. The program calculates pressure profiles and frictional pressure losses along the mud circulating path, and mud rheological parameters inside and outside the drill string. Output screens also compare corrected values with uncorrected values to illustrate the magnitude of the effects of temperature and pressure.

NOTE: Computer screens within this PDF document may appear slightly distorted. This is due to limitations in the Adobe Acrobat Viewer when displaying graphics. To clearly view details in the graphics, zoom in or print the document.



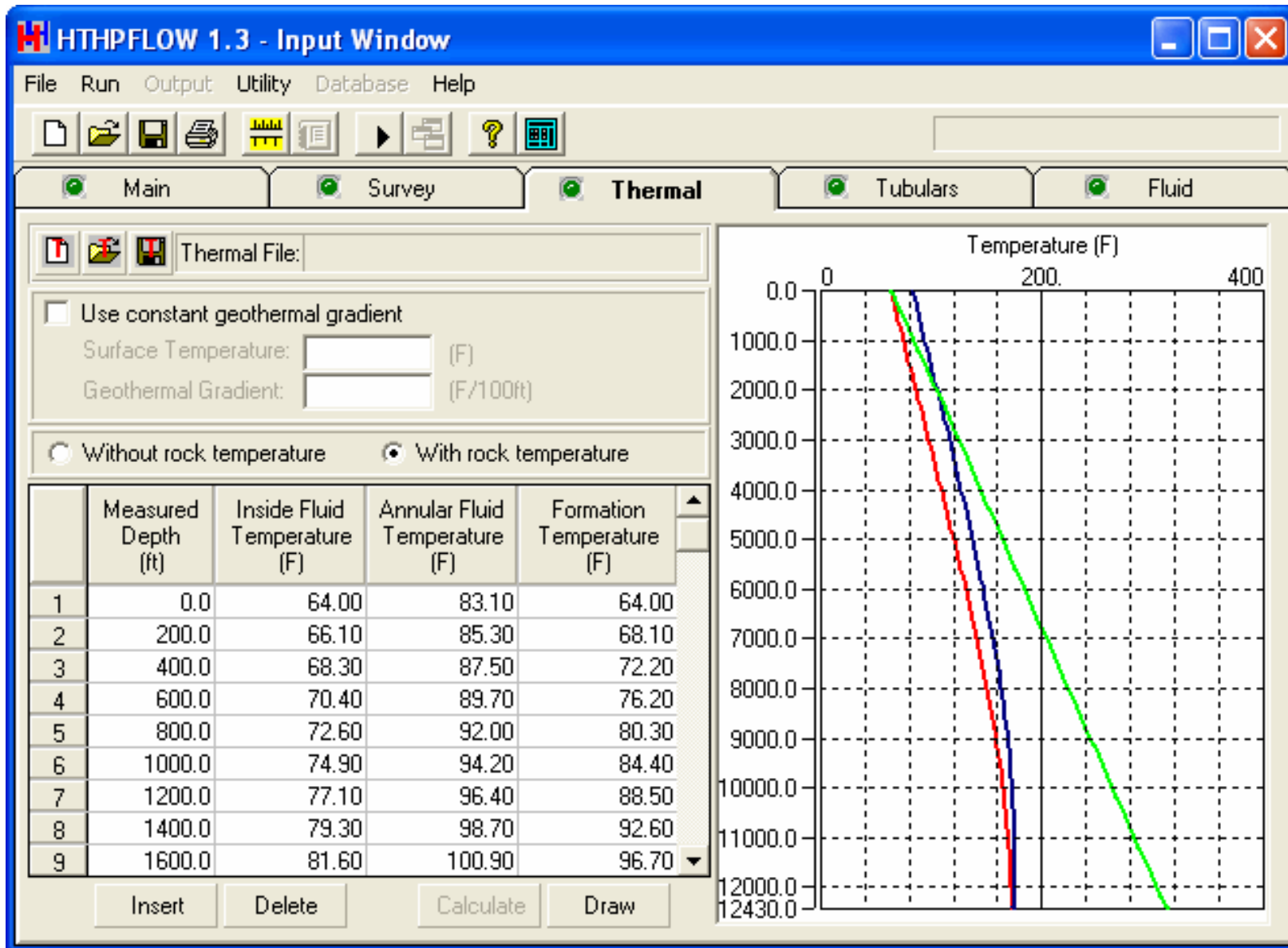


HTHPFLOW is a user-friendly package with a variety of powerful features. Design and navigation around the program is very logical. The first input screen, the Main page, stores documentation to identify specific clients, wells, fields, etc.



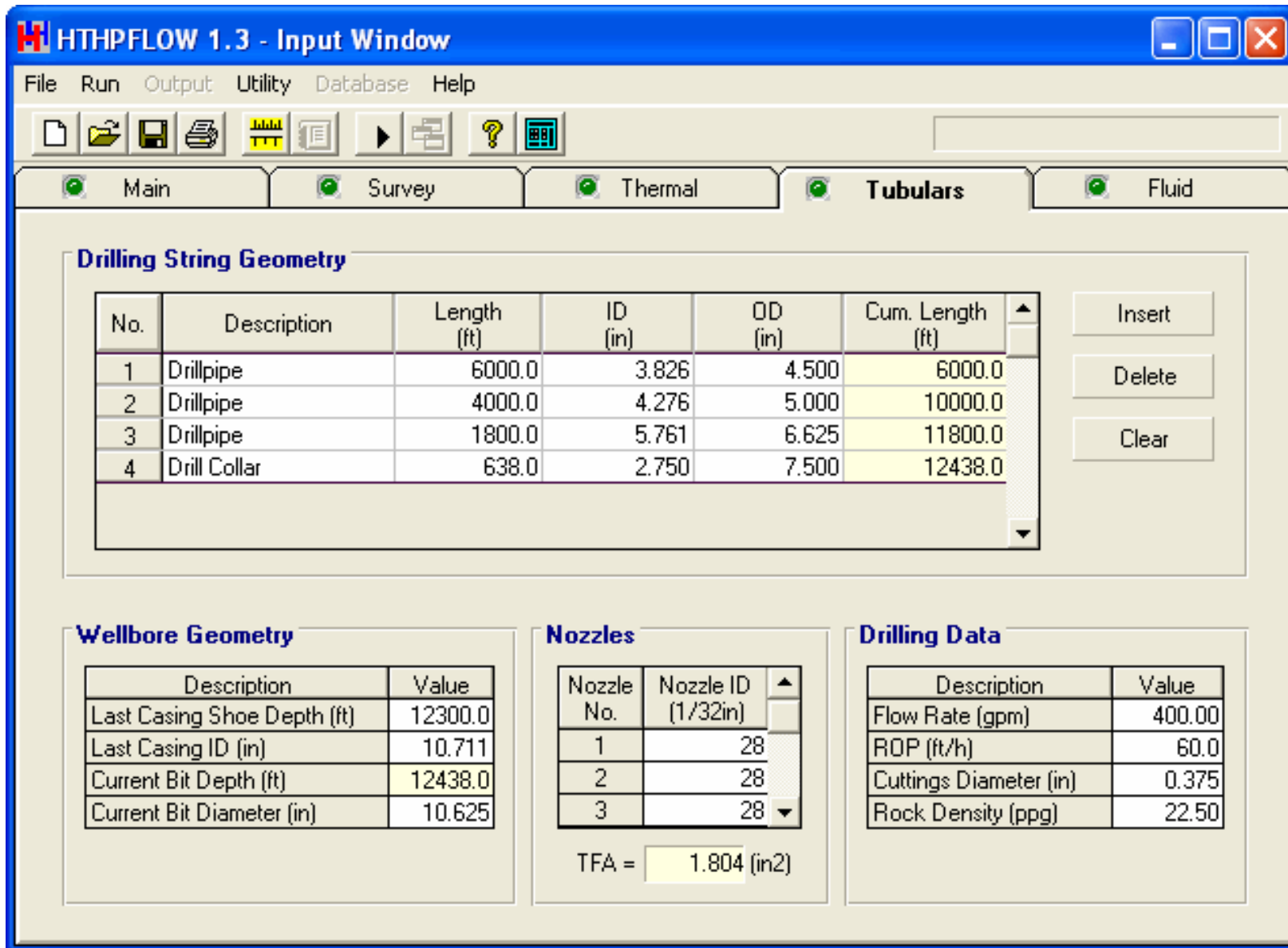
HTHPFLOW

The Survey page is for entering the wellbore survey that describes the well trajectory. Data may be entered manually, imported, exported, or copied from a spreadsheet.



HTHPFLOW

The Thermal page is used to input formation and fluid temperatures with depth for correcting fluid rheology. Temperature data can be entered into **HTHPFLOW** manually or imported from MTI's thermal simulation program **GTEMP**.



Drillstring components and wellbore geometry are specified on the Tubulars page. Enter specific sizes for bit nozzles or total flow area (TFA) through the bit.

HTHPFLOW 1.3 - Input Window

File Run Output Utility Database Help

Main Survey Thermal Tubulars **Fluid**

Mud Type/Weight

Water Base Mud
 Oil Base Mud with Asphalt
 Oil Base Mud without Asphalt

Mud Weight (ppg)

Rheology Model

Bingham Plastic
 Power Law

Data Input Option

Rheological Parameters
 Viscometer Readings

Data Source

Fann 70
 Fann 50
 Others

Rheological Parameters (Bingham Plastic)

Plastic Viscosity (cp)

	T=64	150	200	250	300	350	400	▲
P=0	42.800	20.000	11.400	6.600	3.300	1.600	0.900	
1000	46.900	21.600	12.100	6.800	3.600	1.900	1.200	
4000	60.300	26.600	14.300	7.900	4.600	2.900	1.900	
8000	81.600	34.800	17.900	11.000	7.100	4.400	2.700	▼

Yield Point (lbf/100ft²)

	T=64	150	200	250	300	350	400	▲
P=0	40.60	19.00	10.90	6.20	3.20	1.60	0.90	
1000	41.10	20.50	11.50	6.50	3.40	1.80	1.10	
4000	52.80	25.30	13.60	7.50	4.40	2.70	1.80	
8000	71.40	33.00	17.00	10.40	6.70	4.20	2.50	▼

Viscometer Readings

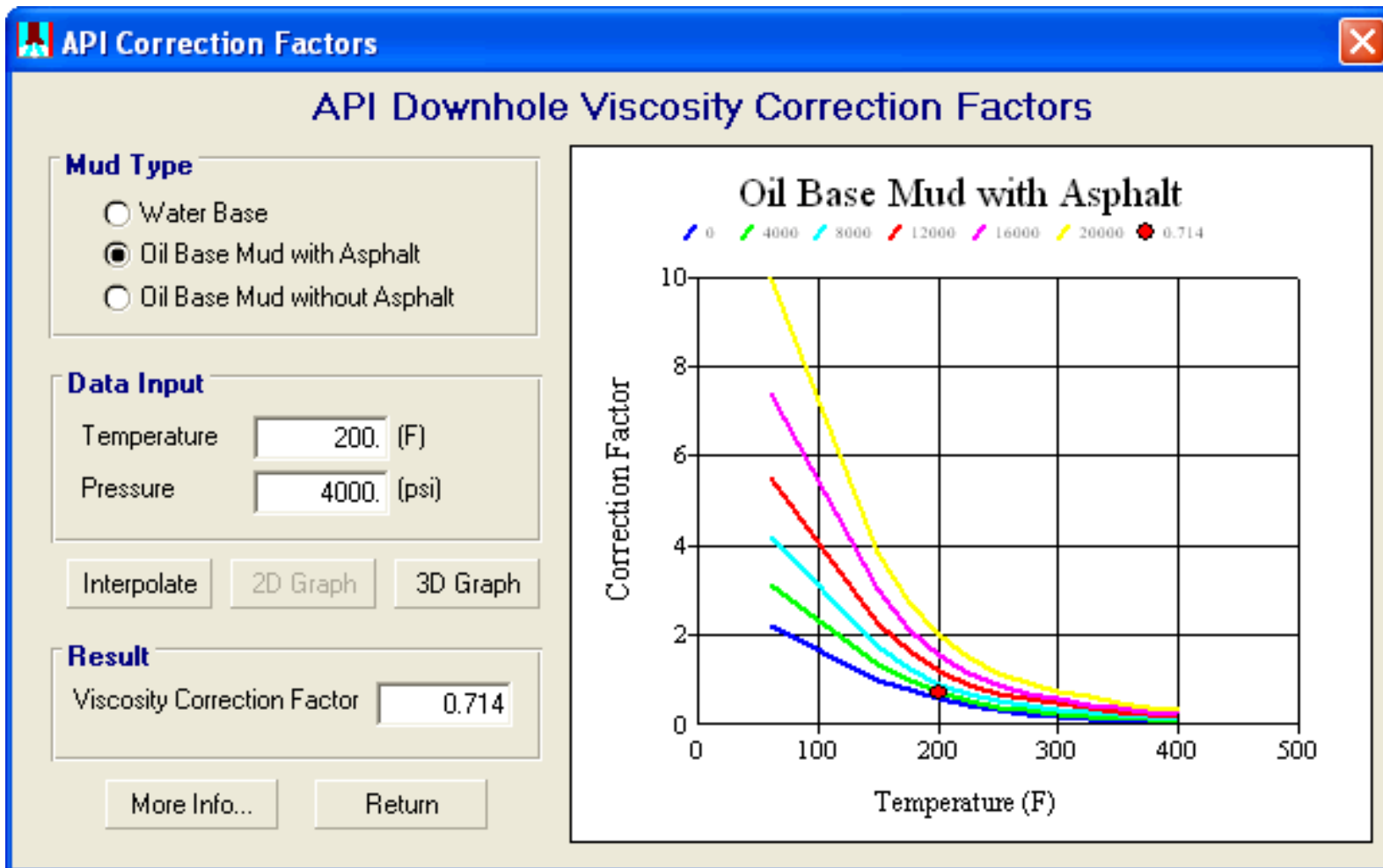
Calculate Clear Enlarge

	T (F)	P (psi)	R3	R6	R100	R200	R300	R600	▲
1	64	0							
2	64	1000							
3	64	4000							
4	64	8000							▼

Help

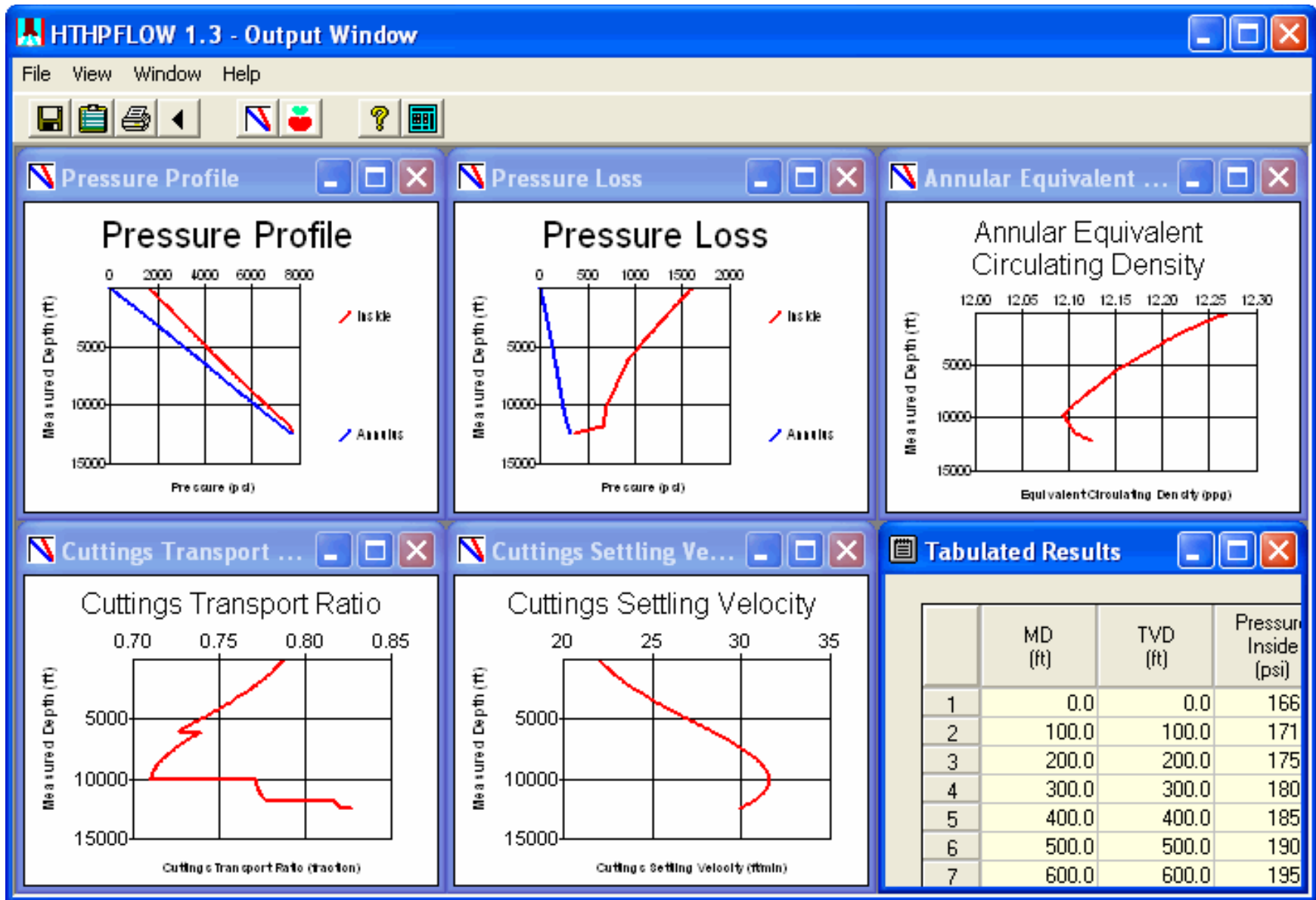
Color Code
API Factors
Fill in
View Graph
Clear
Add to DB

The Fluid page provides options for different mud types, rheology models, data options, and data sources. To calculate drilling hydraulics accurately, **HTHPFLOW** takes into account variation in rheological parameters with temperature and pressure instead of assuming that they are constant.



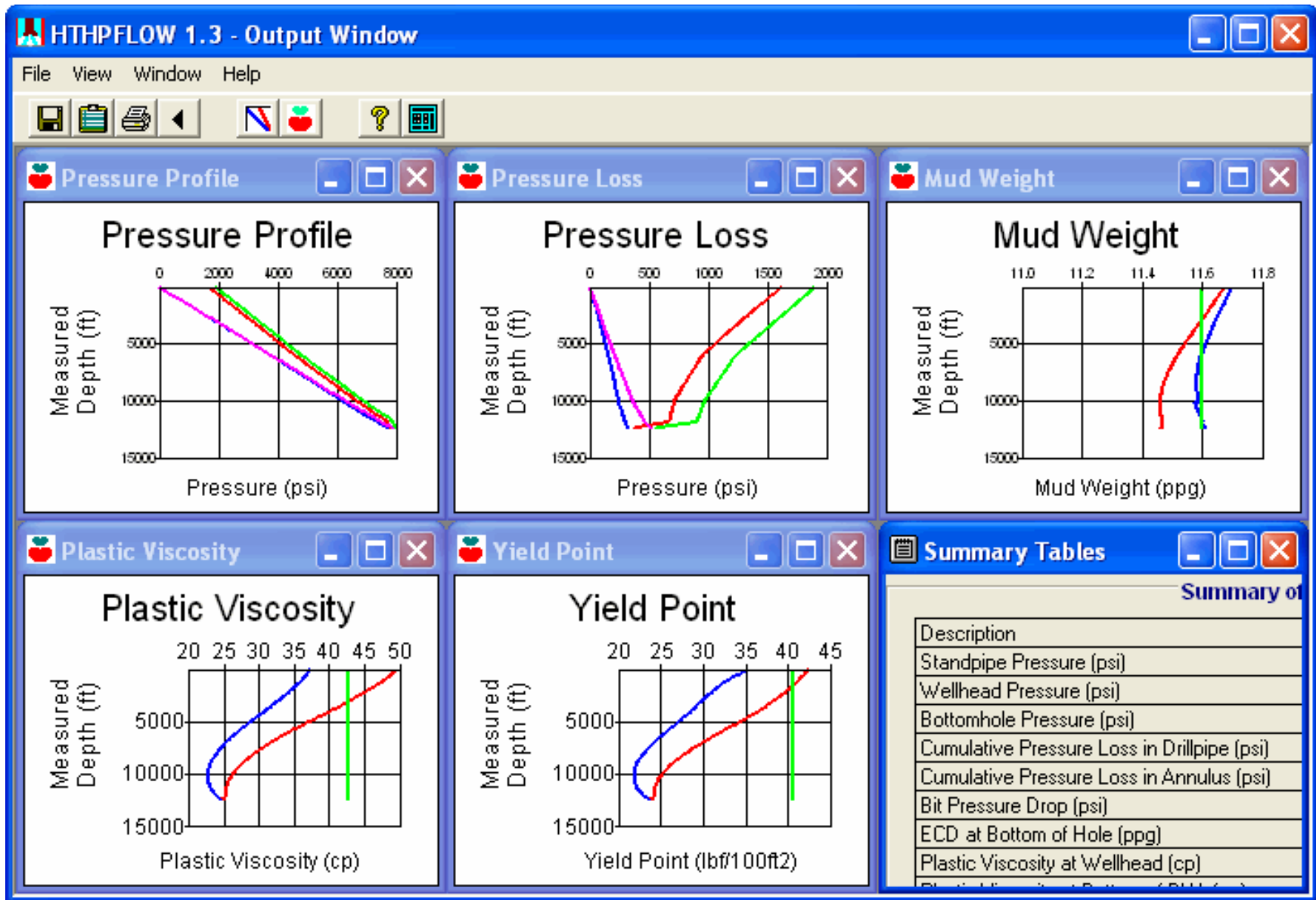
HTHPFLOW

For calculating hydraulics of HTHP wells, viscosity of the drilling fluid should be determined at downhole conditions. However, if downhole properties are not known, corrections can be made based on surface conditions. API Correction Factors (average viscosity ratios obtained from measurements with a variety of drilling fluids) are easy to apply.



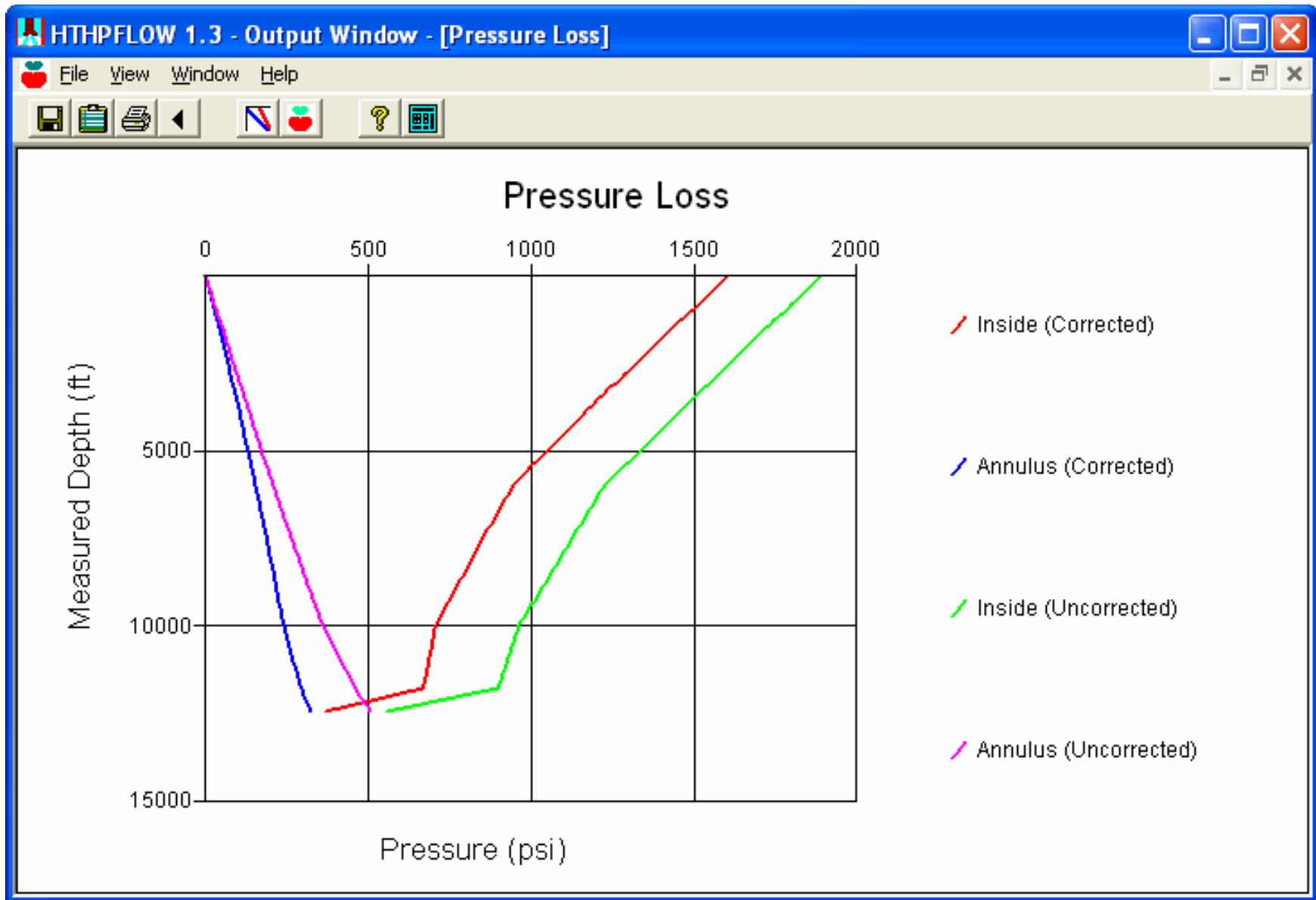
HTHPFLOW

After all required input data are ready, you can immediately view the Output window. A variety of hydraulics output parameters and formats are available for review and comparison.



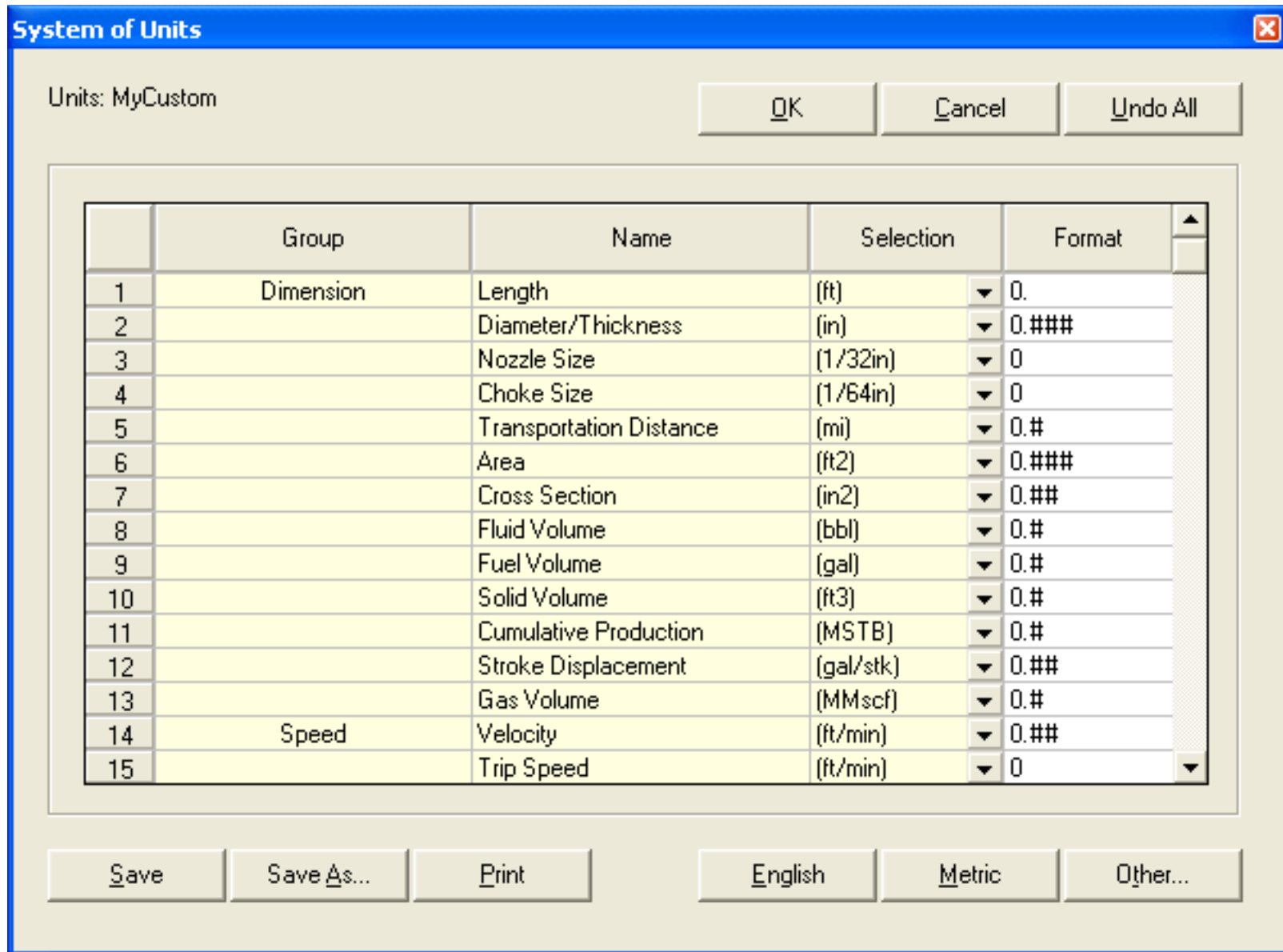
HTHPFLOW

A second set of output graphs and tables is accessed by selecting the Compare window. These graphs compare the uncorrected (constant) rheology to the corrected (temperature- and pressure-dependent) rheology.



HTHPFLOW

For example, the Pressure Profile graph charts pressure drop down the drillstring, across the BHA, and up the annulus with and without temperature/pressure corrections.



Units for input and output displays are easy to select and customize. Choose between the default metric or English systems, or a custom combination of units (for example, depth in meters, hole size in inches). Custom systems are saved and automatically recalled in future sessions.

Help for HTHPFlow

File Edit Bookmark Options Help

Back Print

Contents Index Search

- Introduction
 - Background
 - Features of HTHPFLOW
- Input Windows
- Output Windows
 - Main Output Window
 - Comparison Output Window
 - Menus
 - Icons
- Other MTI Software

Background

Rheological properties of drilling fluids are usually considered to be independent of pressure and temperature. In many cases, this may be a good approximation. For shallow wells, temperature changes are not large, so variations in rheology with temperature are small. Also, many wells have a large gap between pore pressure and fracture pressure, so errors in the estimation of the dynamic circulation pressure may not have significant consequences for integrity or kick probability. However, for wells with small margins between pore pressure and fracture pressure, careful analysis of the effects of temperature and pressure on wellbore hydraulics and the potential for kicks is needed.

HTHPFLOW was developed by **Maurer Technology Inc.** to address the industry's need for detailed analysis of wellbore hydraulics and improved drilling operations for high-temperature/high-pressure wells. The program calculates pressure profiles and frictional pressure losses along the mud circulating path, and mud rheological parameters inside and outside the drill string. Output screens also compare corrected values with uncorrected values to illustrate the magnitude of the effects of temperature and pressure.

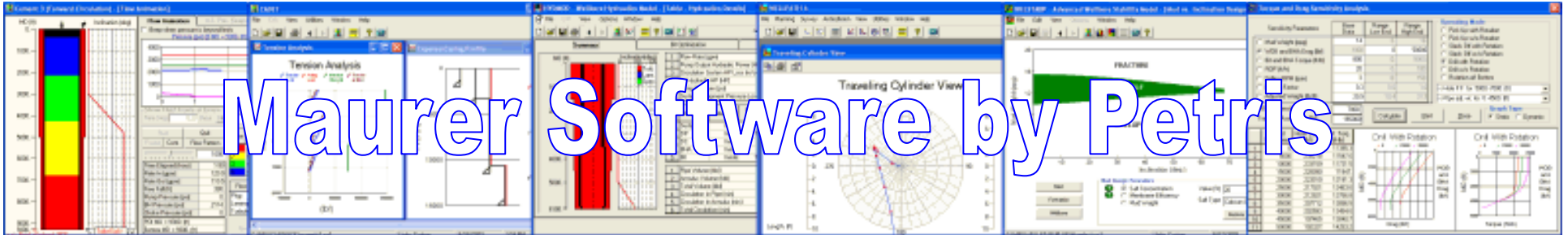
Pressure Profile

Depth (ft) vs Pressure

In Drill String (Corrected)

HTHPFLOW

A comprehensive On-Line Help System is also provided. Tips on program operation, program structure, and basic theoretical background are immediately available at the click of a button.



Thanks for your interest in HTHPFLOW

*For more information on Maurer Software by Petris,
email:*

sales@petris.com

or visit us on the web at

www.petris.com

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