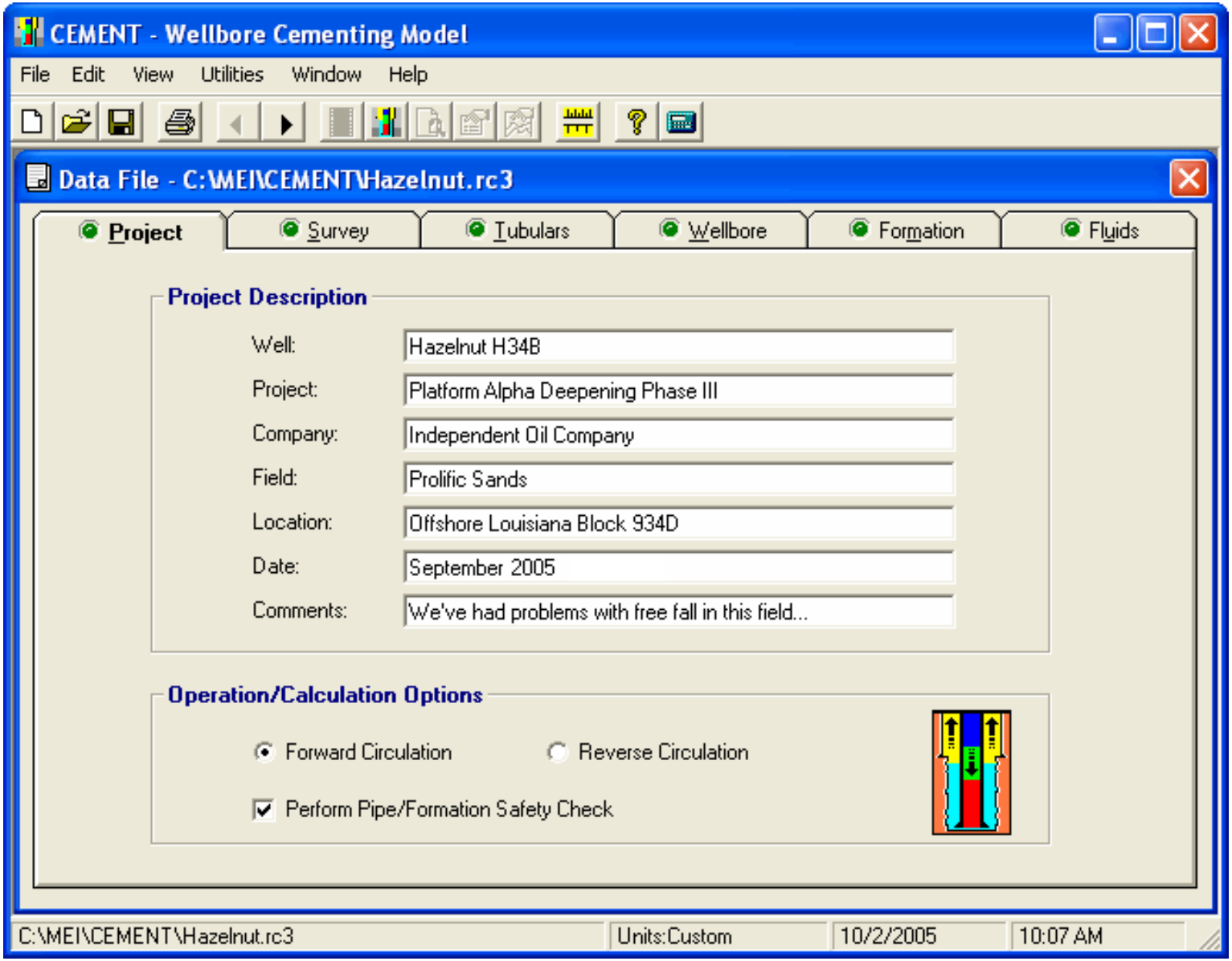
CEMENT – Wellbore Cementing Model

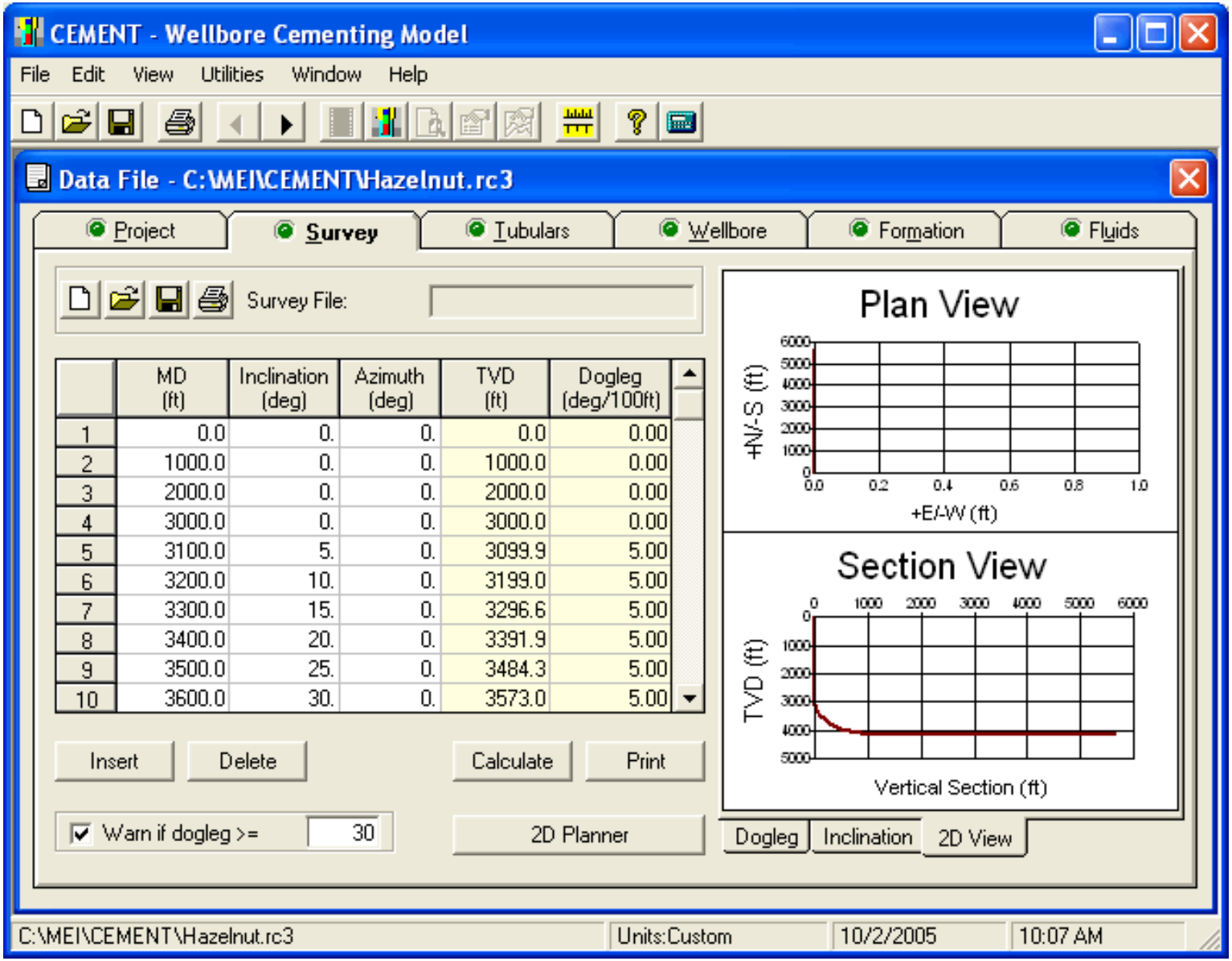
accurately models cement placement by addressing U-tubing phenomena, dynamic injection pressures, equivalent circulating densities (ECD's) and formation breakdown pressures.

Advanced engineering features and animated flow visualization allow engineers to optimize and design cementing jobs prior to actual field operations.

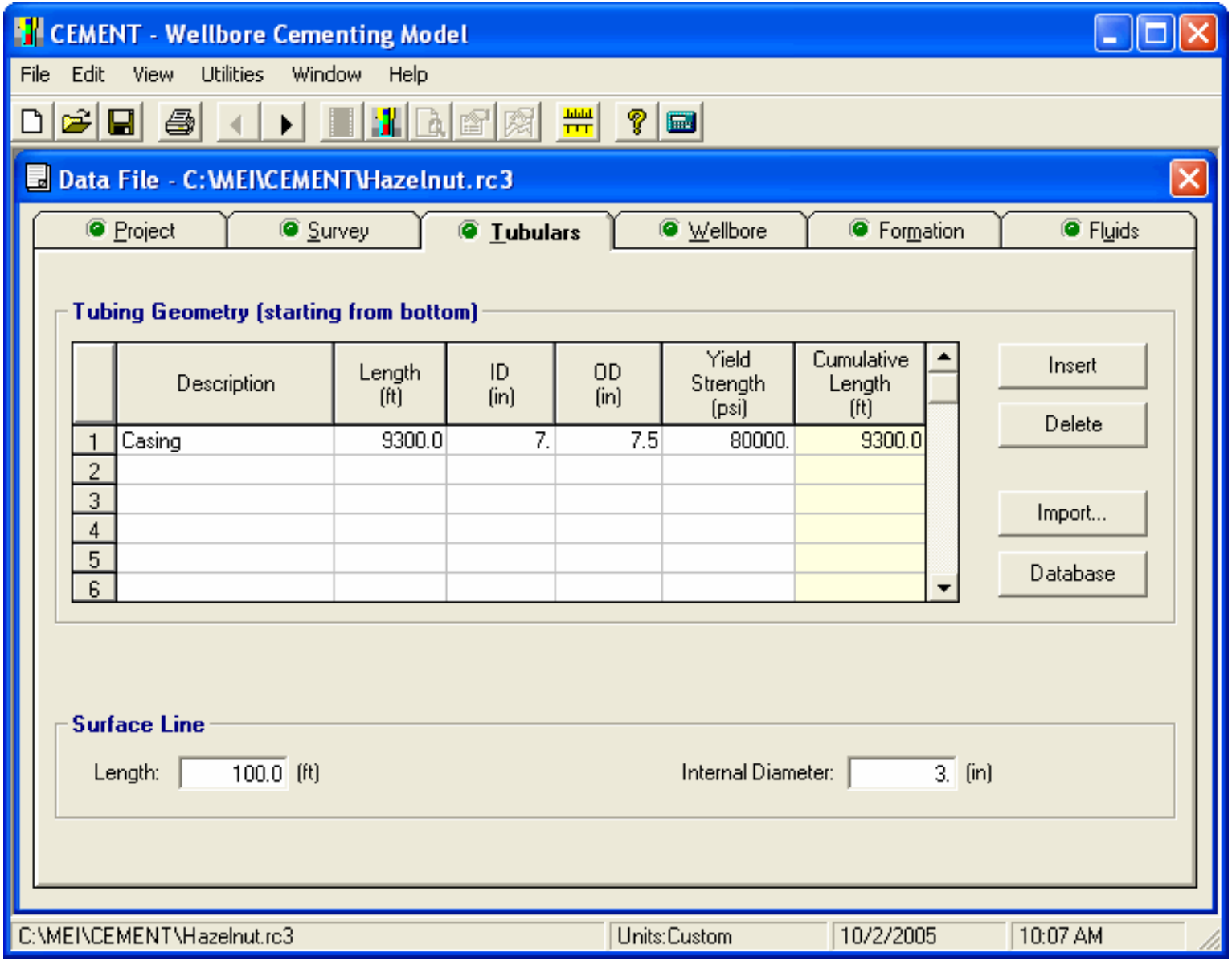
PETRIS



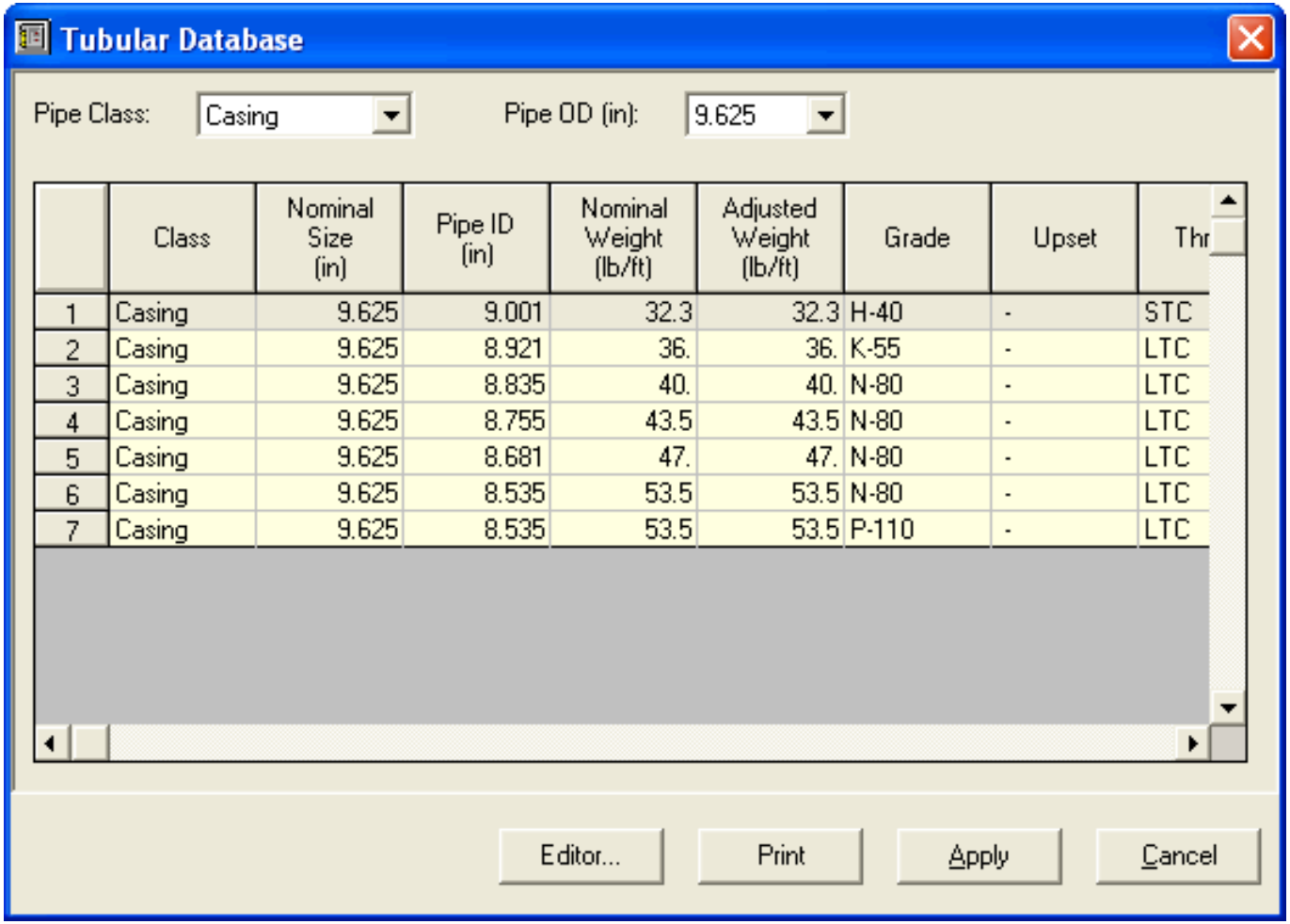
CEMENT has a logical program design and user-friendly interface. The first input page (**Project**) includes basic project information/documentation. Both forward and reverse circulation can be modeled.



The **Survey** page plots the plan and section views, as well as wellbore inclination and doglegs. Survey data describing the wellpath may be entered manually, imported, or copied from a spreadsheet.

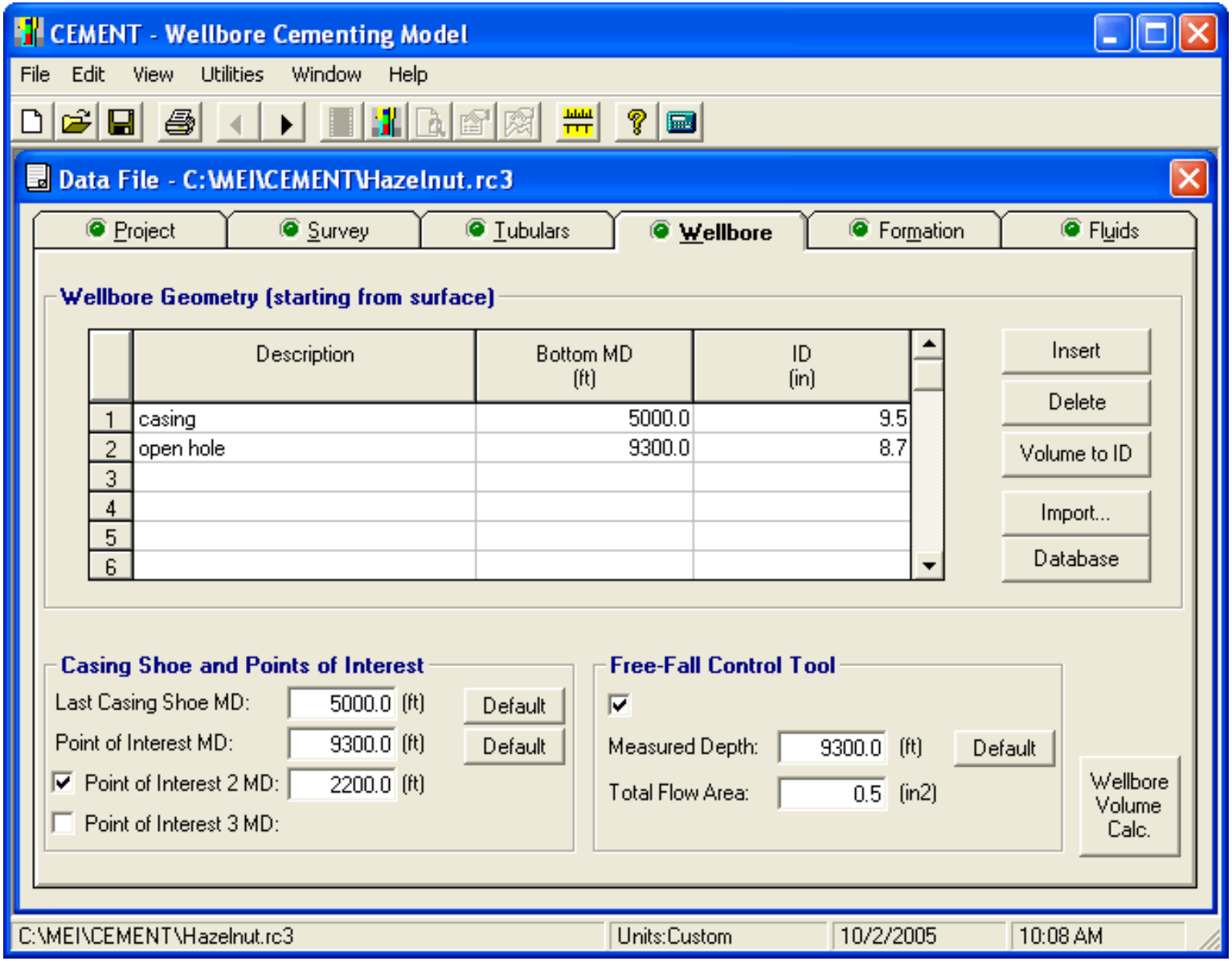


Casing/liner sizes through which the cement is pumped are entered on the **Tubulars** page.

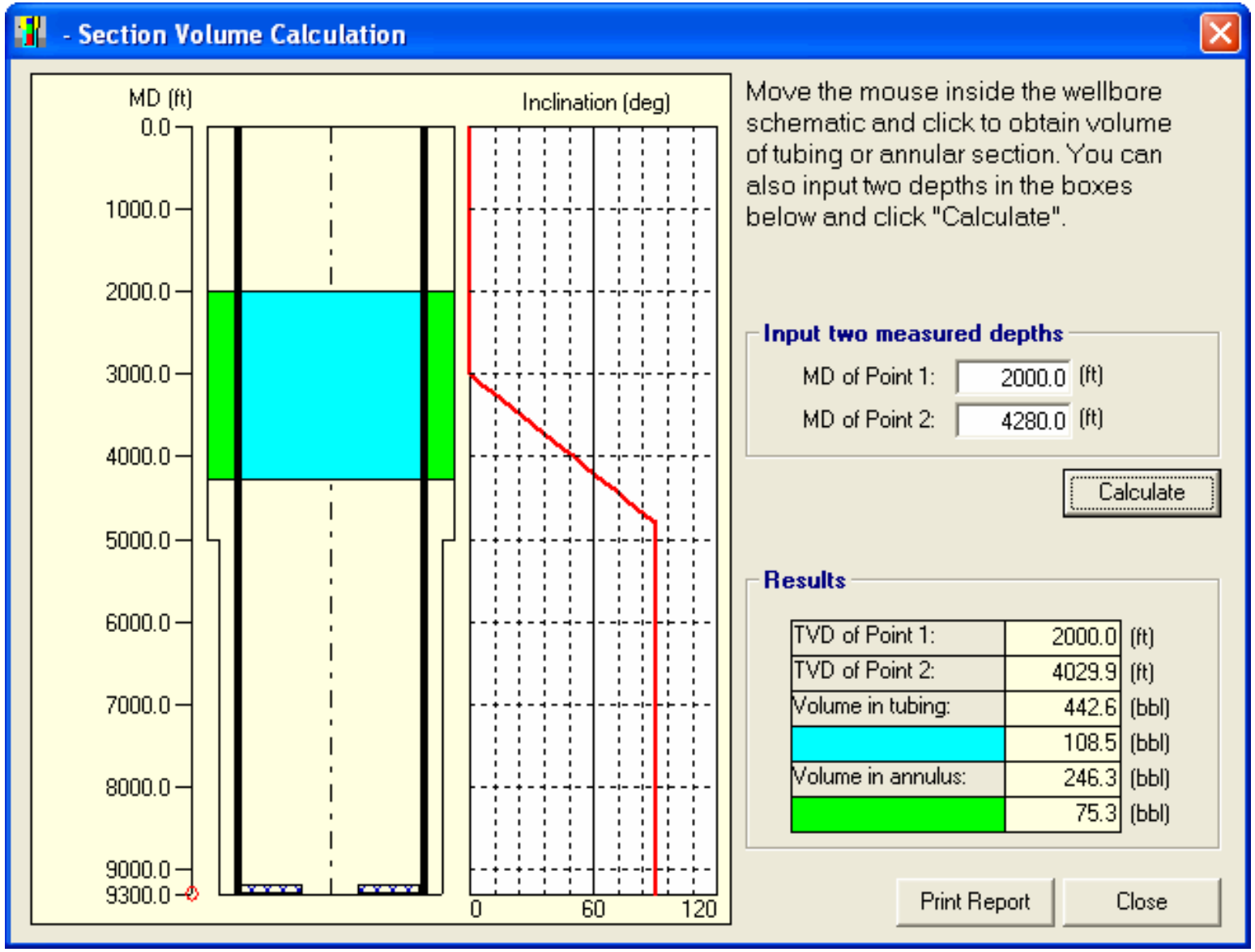


	Class	Nominal Size (in)	Pipe ID (in)	Nominal Weight (lb/ft)	Adjusted Weight (lb/ft)	Grade	Upset	Thr
1	Casing	9.625	9.001	32.3	32.3	H-40	-	STC
2	Casing	9.625	8.921	36.	36.	K-55	-	LTC
3	Casing	9.625	8.835	40.	40.	N-80	-	LTC
4	Casing	9.625	8.755	43.5	43.5	N-80	-	LTC
5	Casing	9.625	8.681	47.	47.	N-80	-	LTC
6	Casing	9.625	8.535	53.5	53.5	N-80	-	LTC
7	Casing	9.625	8.535	53.5	53.5	P-110	-	LTC

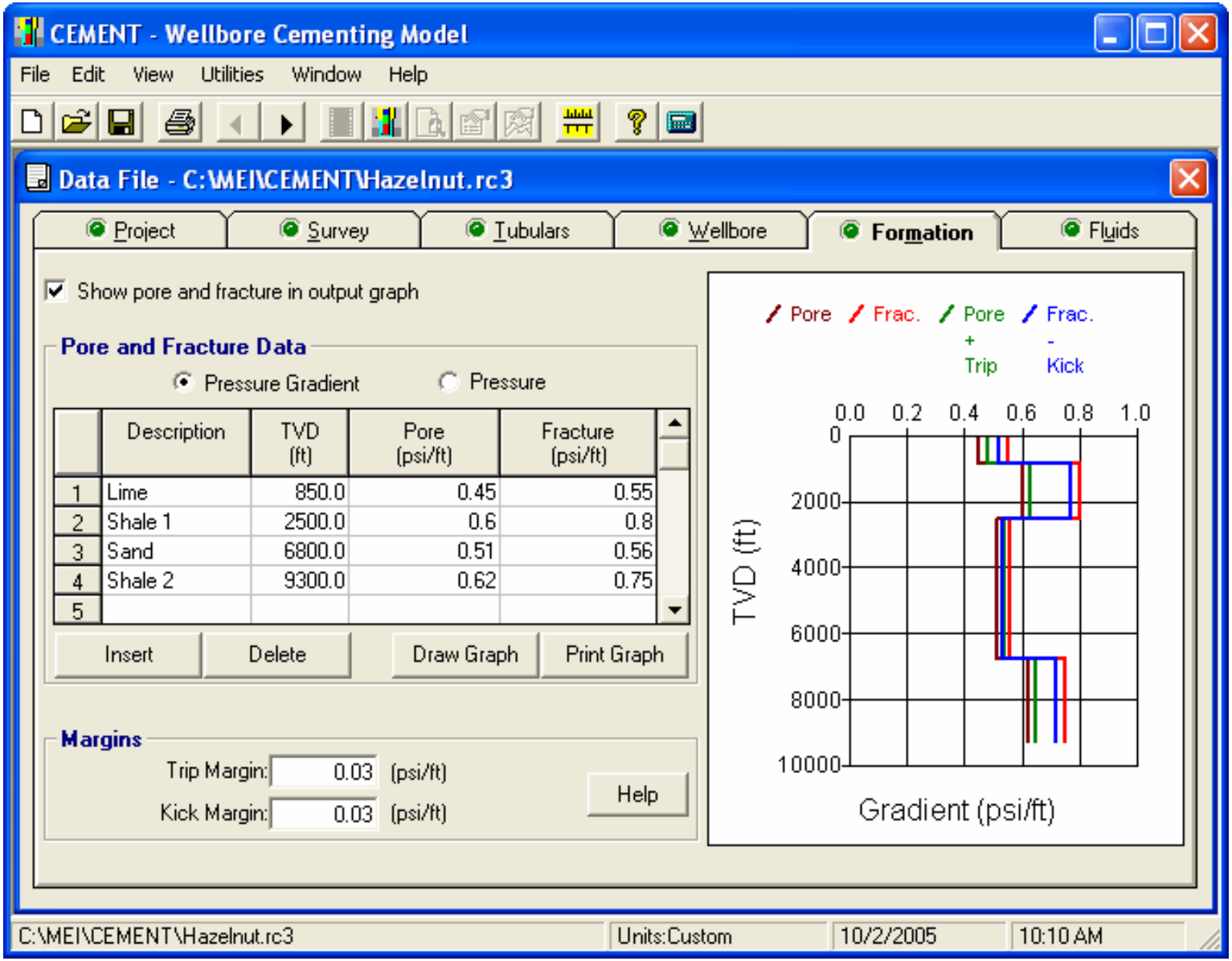
All Maurer Technology programs include an extensive database of tubulars that may be edited/customized. This feature avoids the need to look up the casing's size, weight, ID, etc. each time.



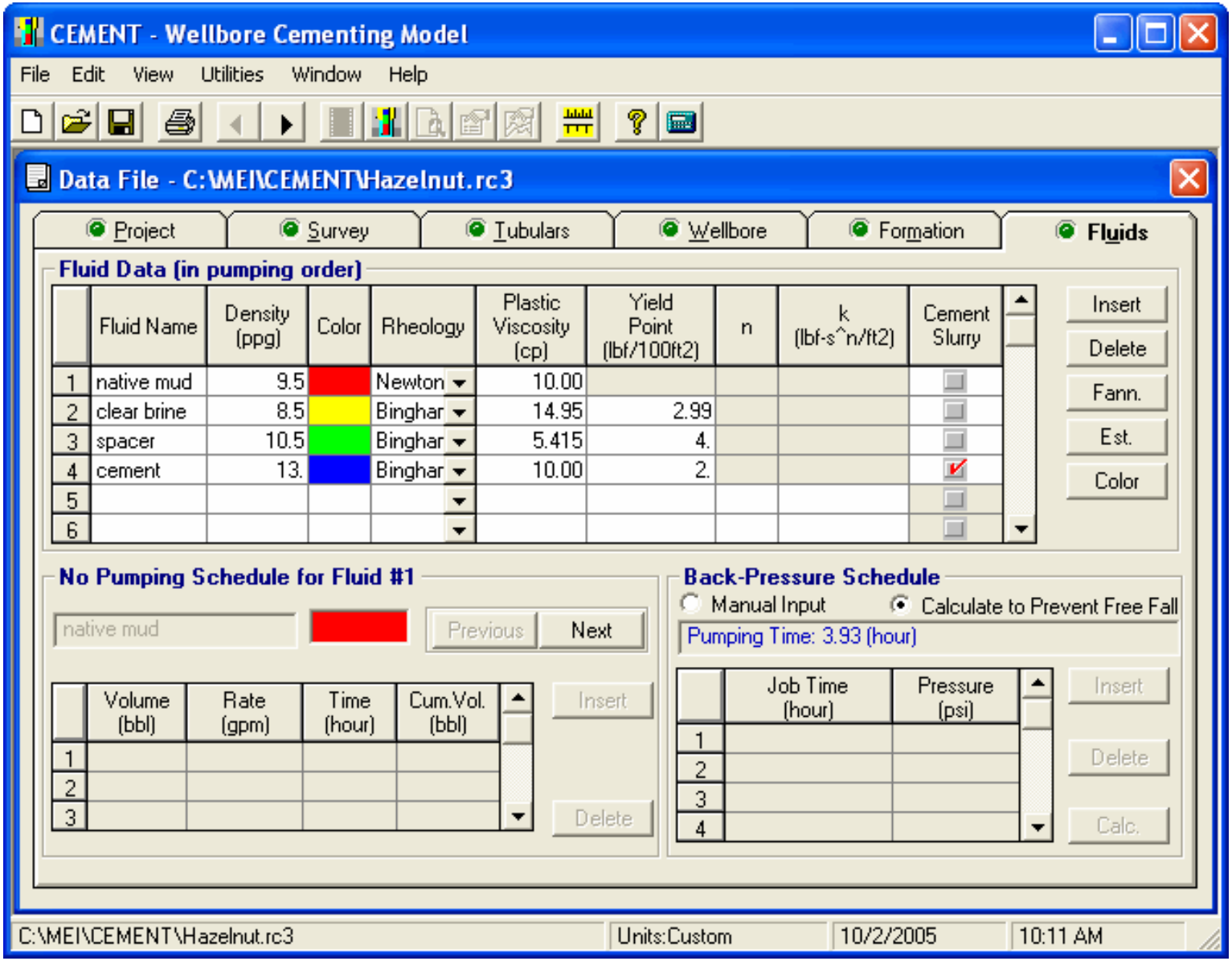
Wellbore geometry is entered on the **Wellbore** page. Excess cement can be modeled by increasing the wellbore ID. User-specified "Points of Interest" can be selected—depths for which more detailed analyses will be performed.



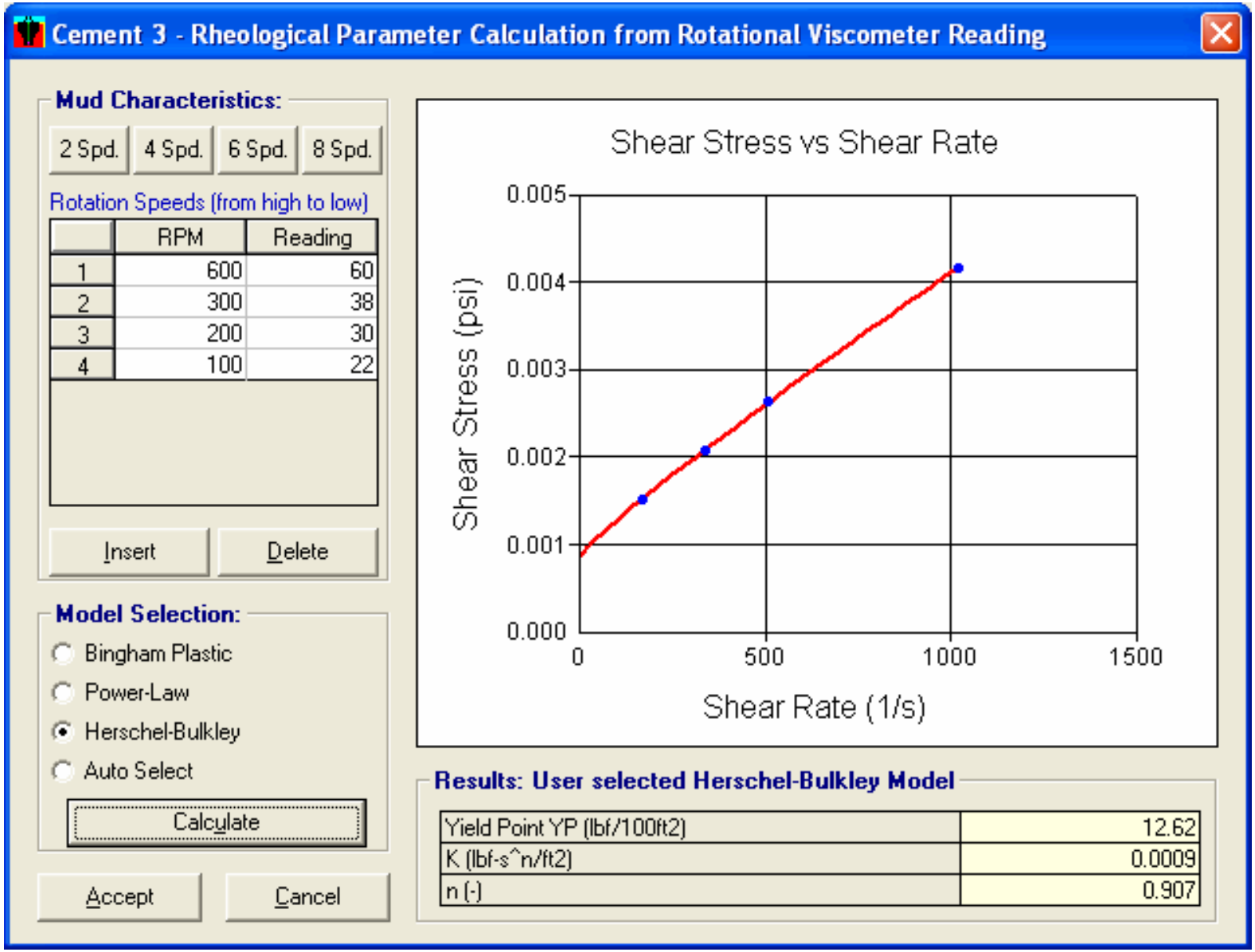
The **Section Volume Calculation** utility quickly calculates annulus (green) and tubing (blue) volumes. This is done very simply by clicking on the upper and lower boundaries of the range of interest, or by directly typing depths of these boundaries.



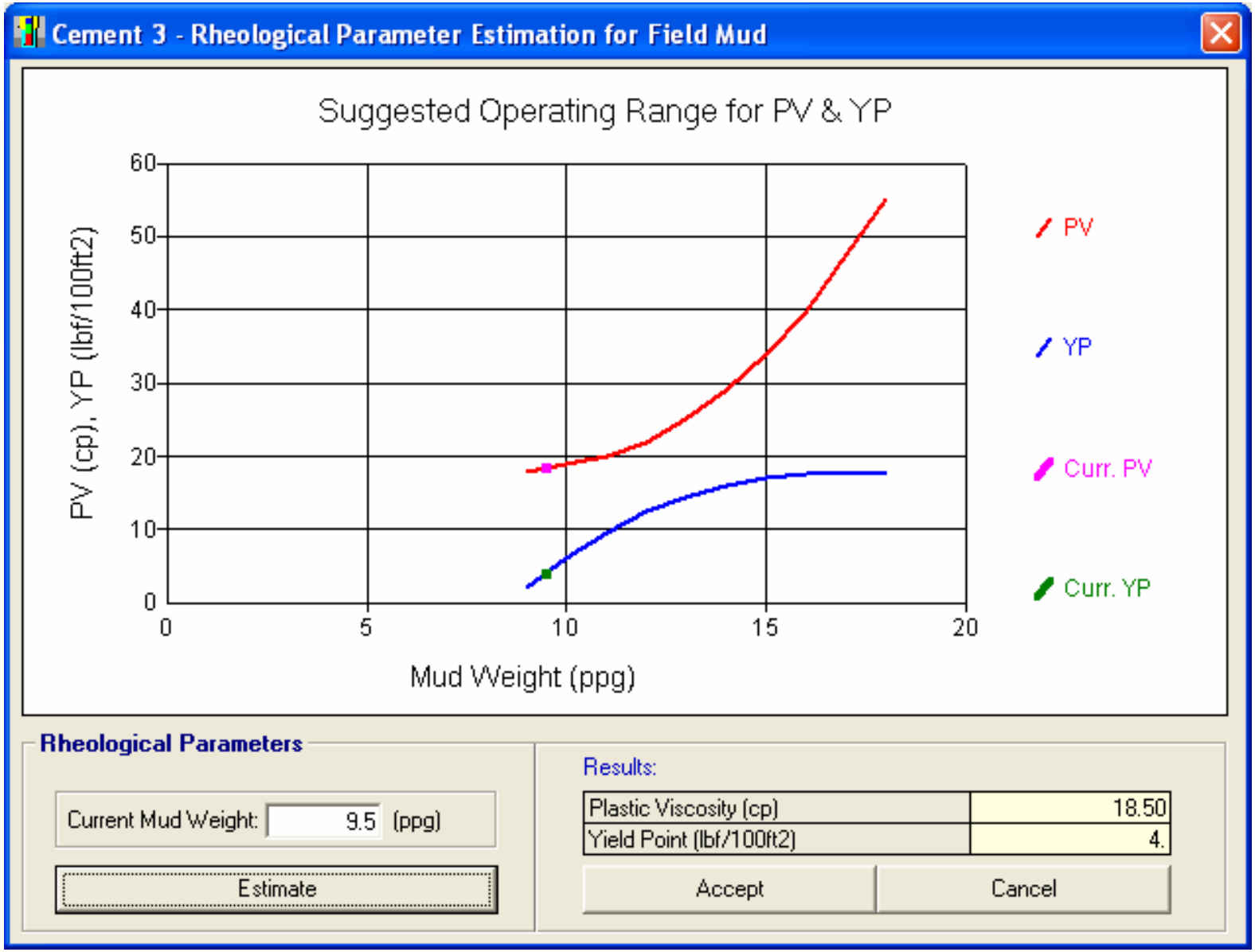
Of major concern during cementing are the dangers of fracturing the formation or of taking a kick. On the **Formation** page, each formation's pore and fracture pressure are entered (as either actual pressures or as pressure gradients).



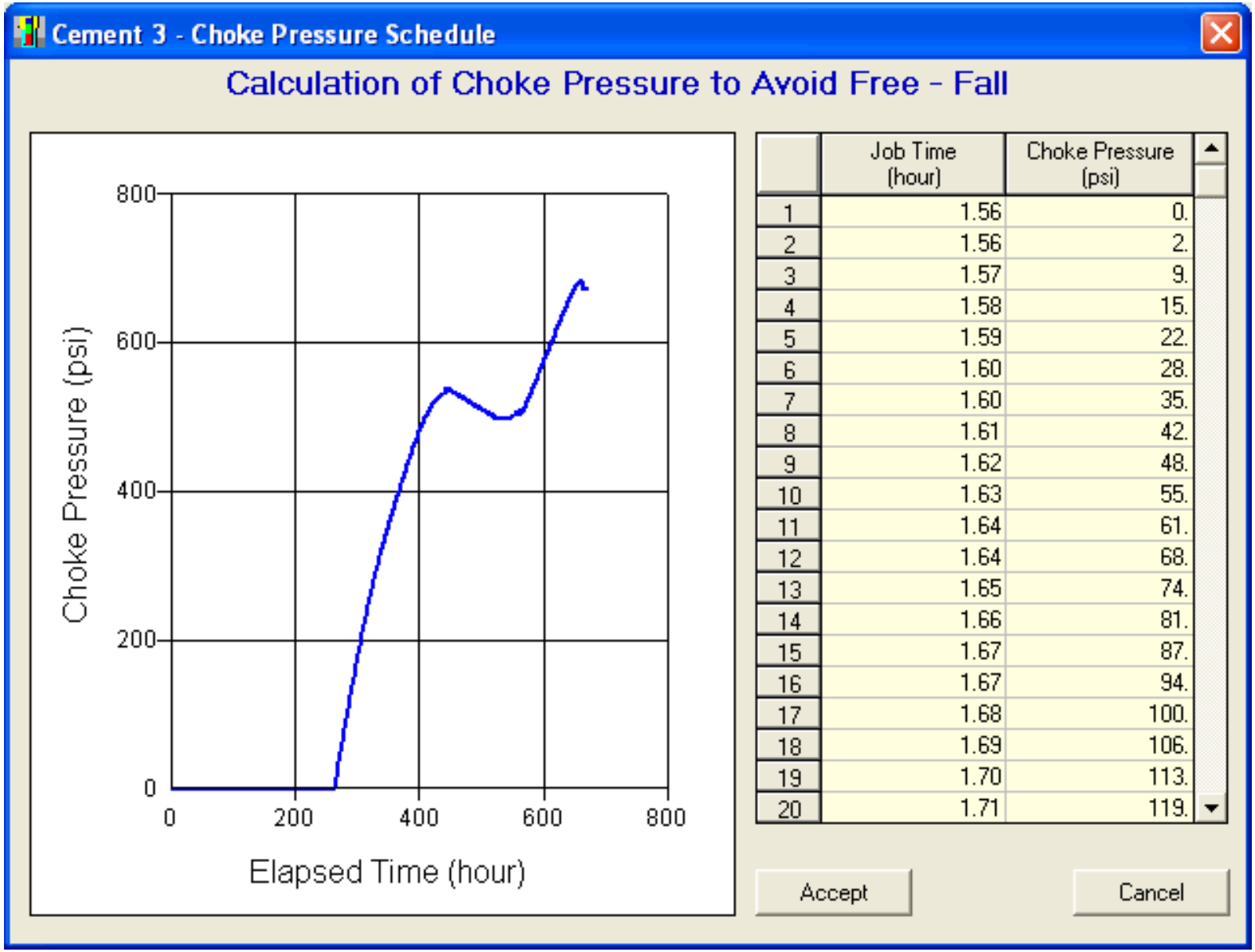
On the **Fluids** page, each cementing stage is described (lead cement, spacers, tail cement, etc.) with its own specific rheological properties, pump rates and schedules.



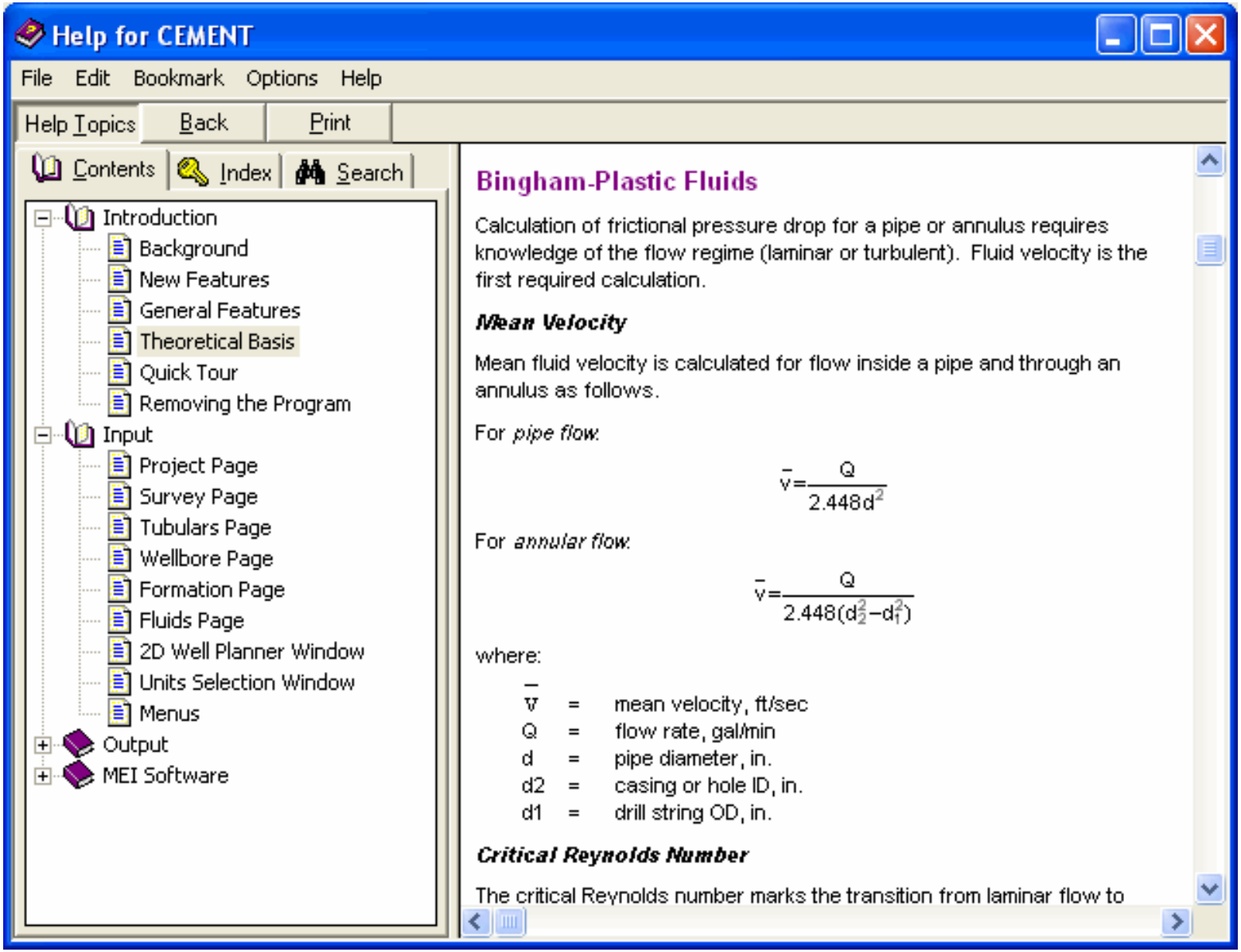
CEMENT can estimate the rheological parameters from rotational viscometer readings. If the best rheological model (Bingham plastic, power-law, Herschel-Bulkley) is not known, the program recommends the best fit to the data.



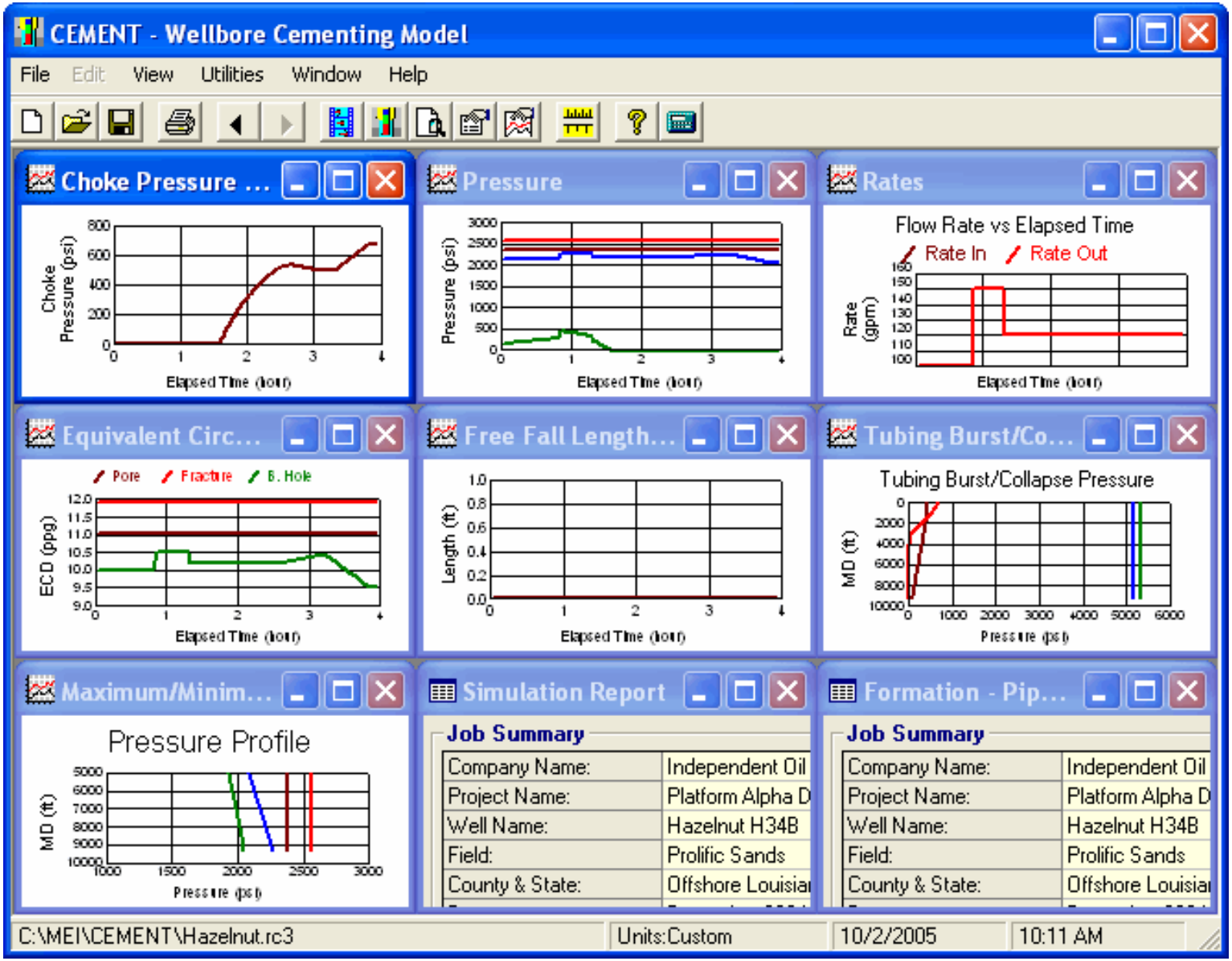
In addition, **CEMENT** can also estimate suggested operating ranges for plastic viscosity and yield point. These may be automatically exported to the **Fluids** page.



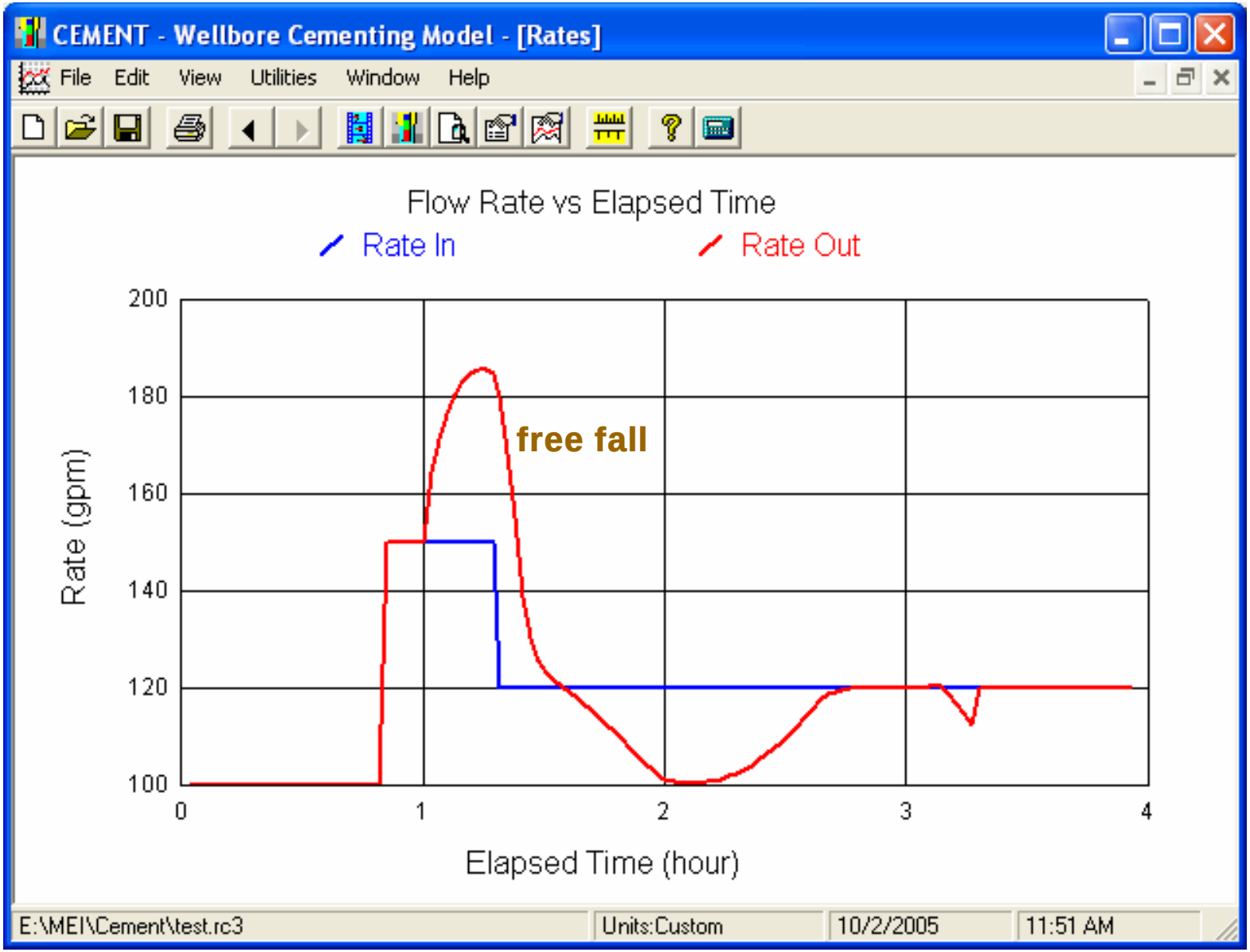
Free-fall, the U-tubing effect commonly associated with cementing, can be regulated (or prevented) by applying appropriate choke pressures on schedule. Here, choke pressures are calculated to avoid free-fall as the job progresses.



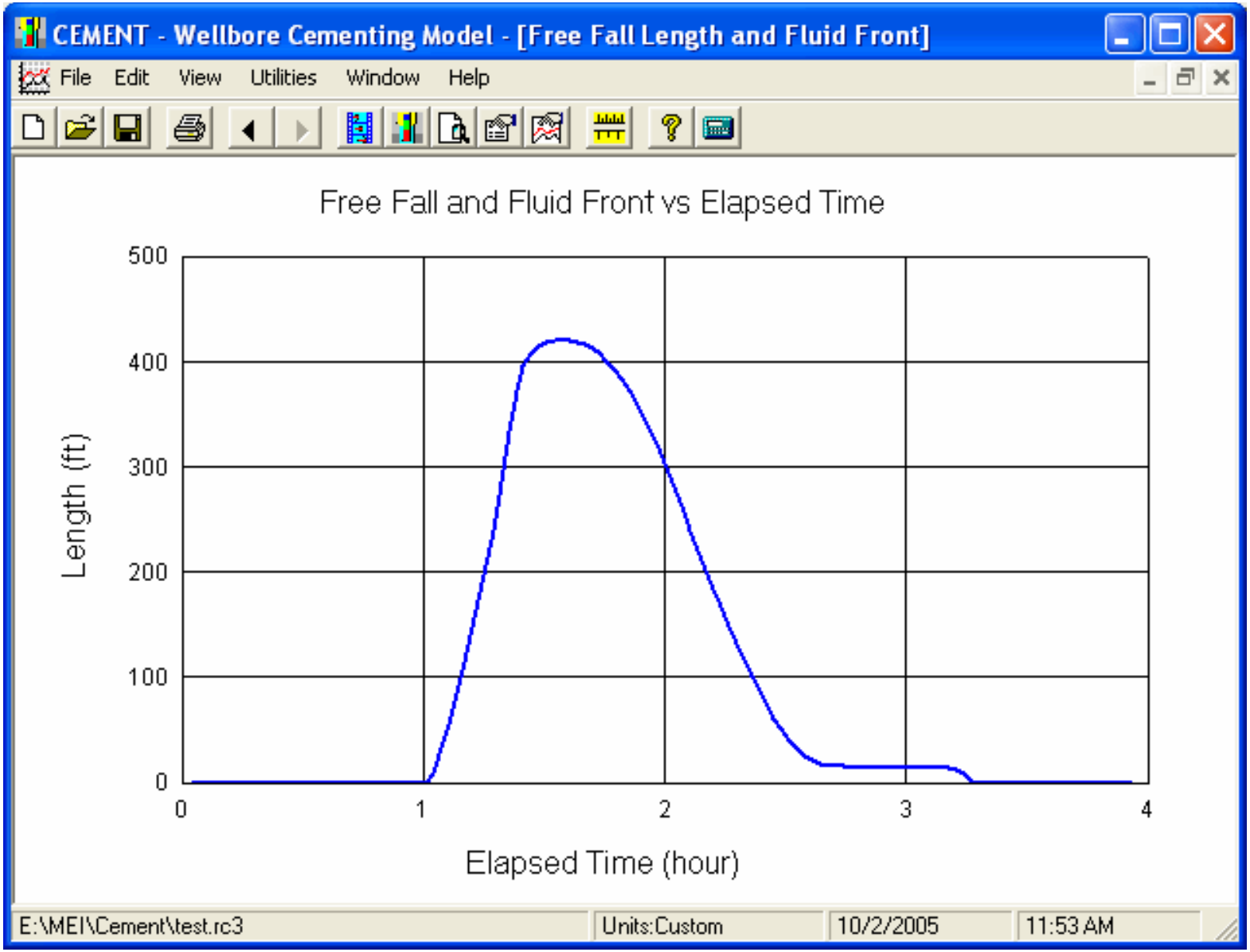
A complete **Online Help System** is available. Click [F1] or the help icon for context-sensitive assistance with program operation, structure, and theoretical background.



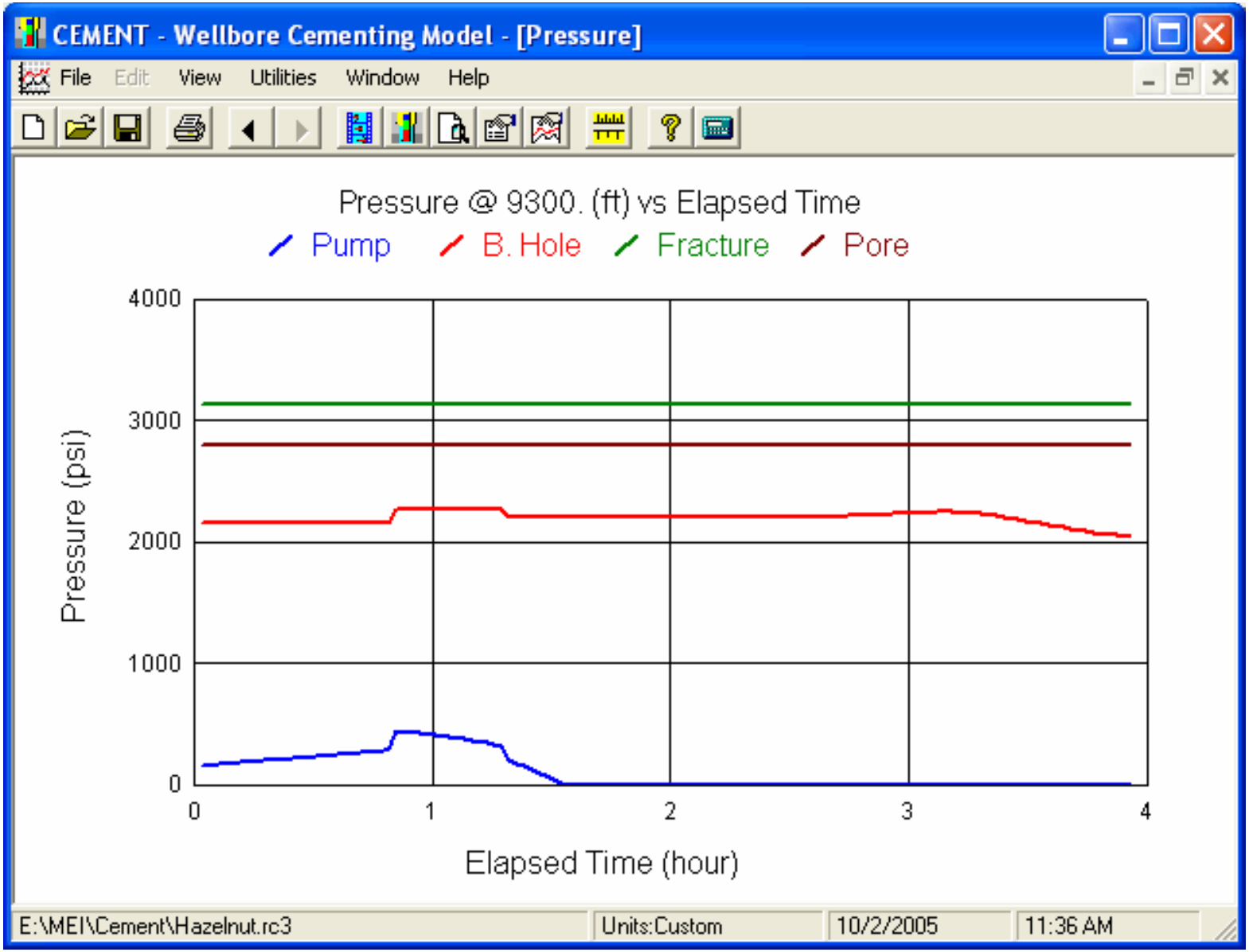
After input data are entered, you can immediately view the results. Several of these output graphs are shown on the following slides. Note that the graph output can be either versus time (shown here) or volume pumped.



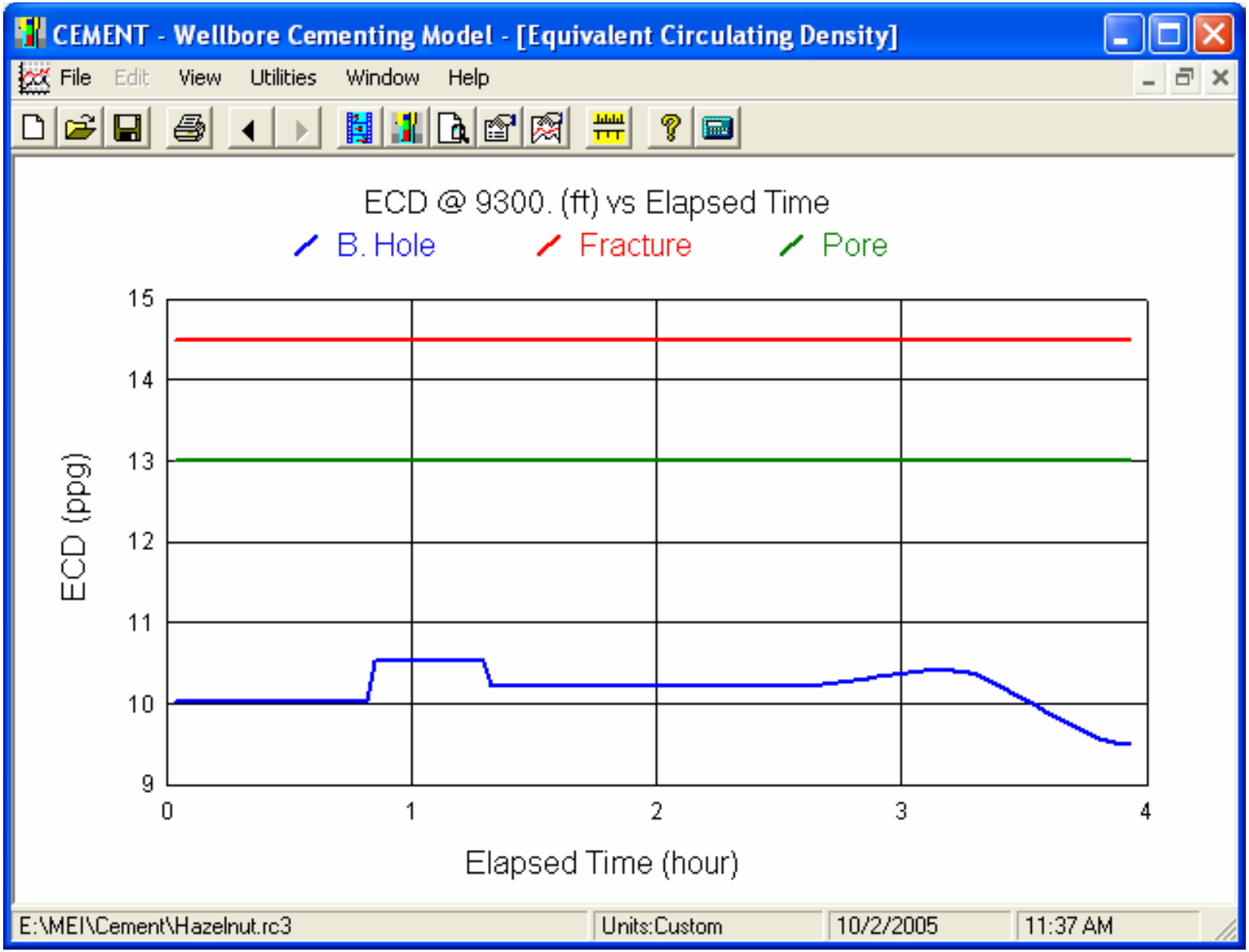
One output graph shows flow rate over time. The blue line is flow rate in; the red line is flow rate out. Note the discrepancy between the two rates during part of the operation. This is caused by free-fall.



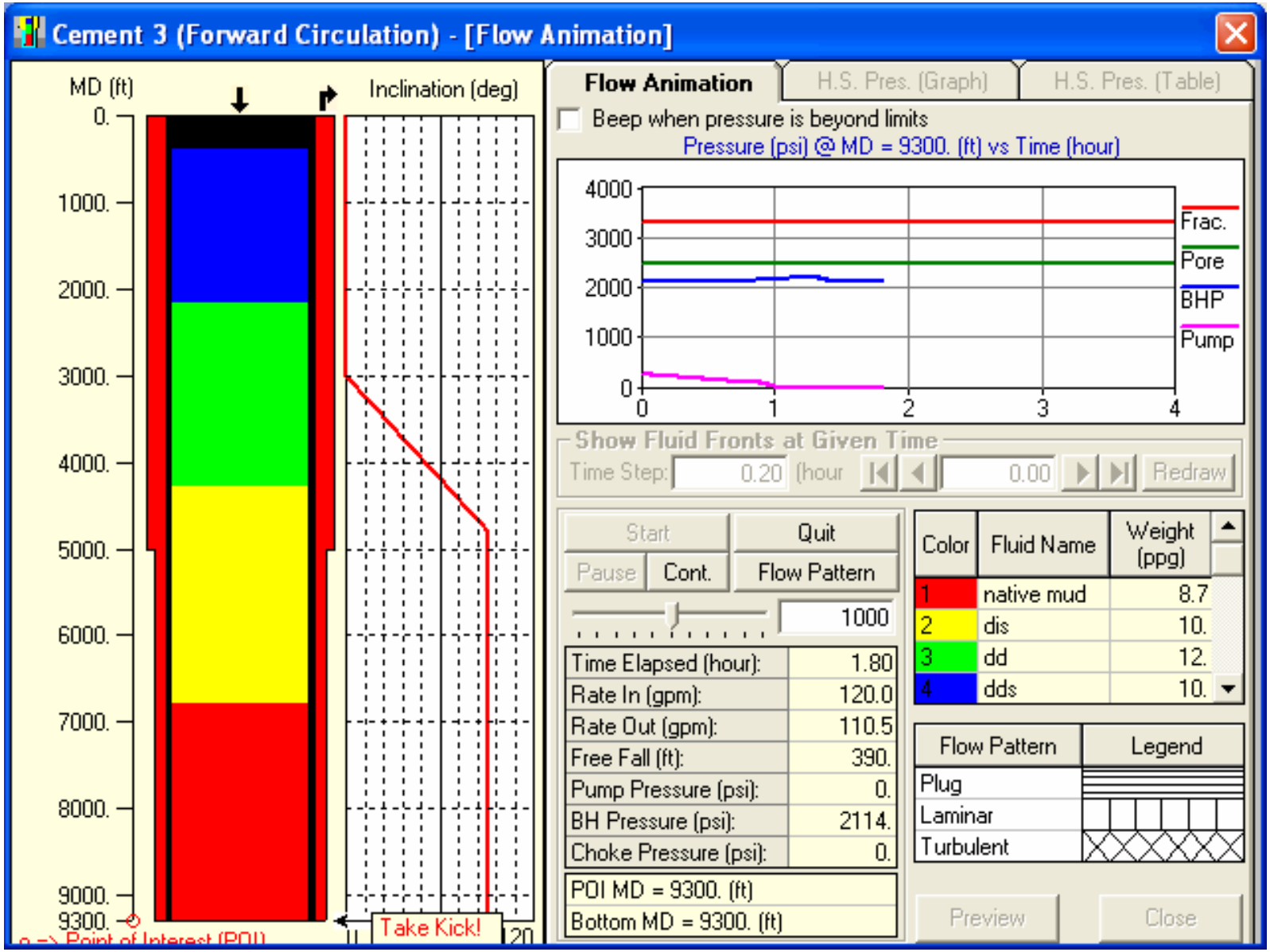
The length of the free-fall column versus elapsed time is shown here. Note: this graph can also be displayed based on pumped volume (instead of time).



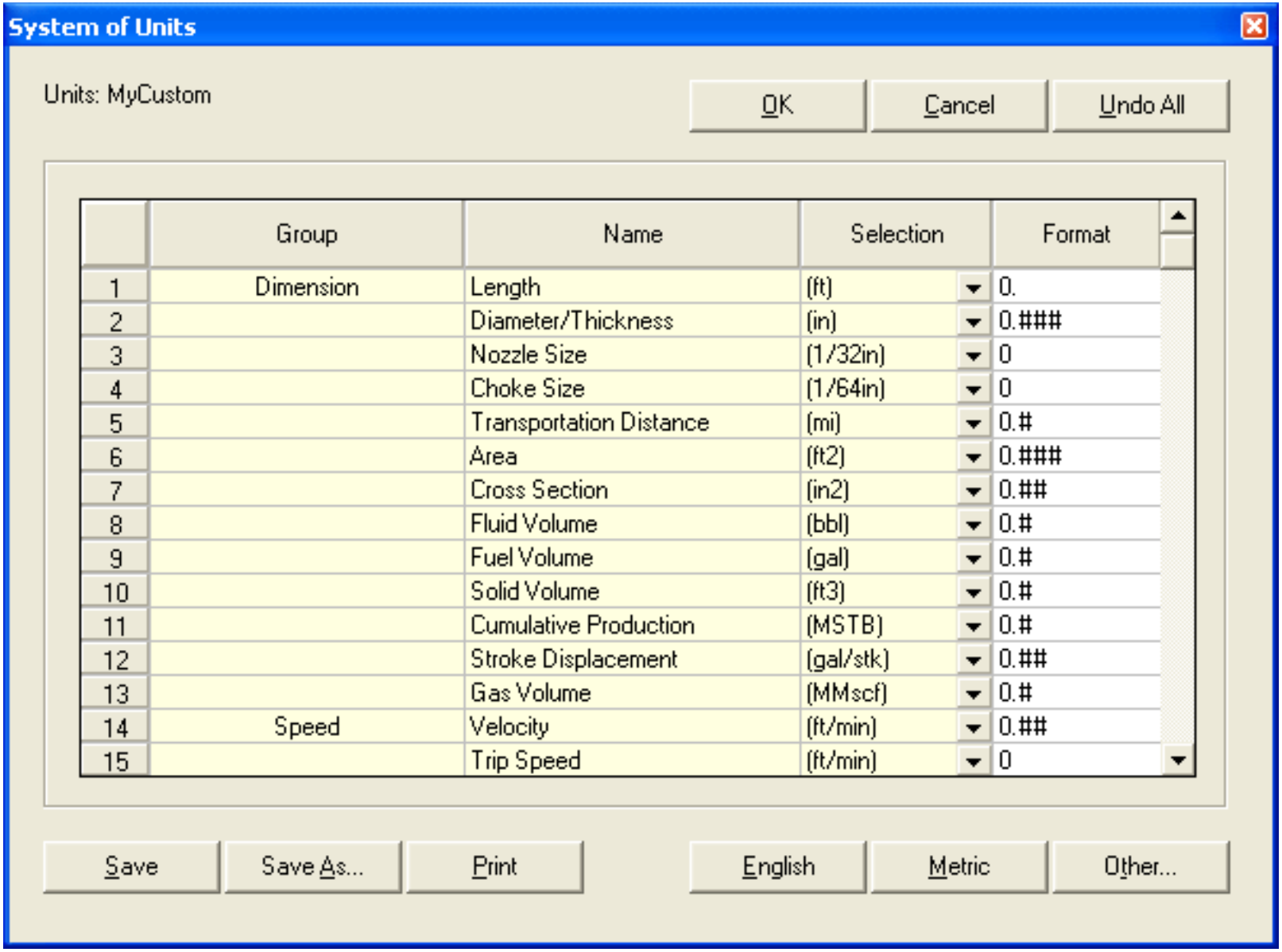
In this pressure/time graph are shown formation fracture pressure, bottom-hole pressure (red), formation pore pressure (brown), and pump pressure (blue). Note that when free-fall occurs, the pump pressure is reduced to zero.



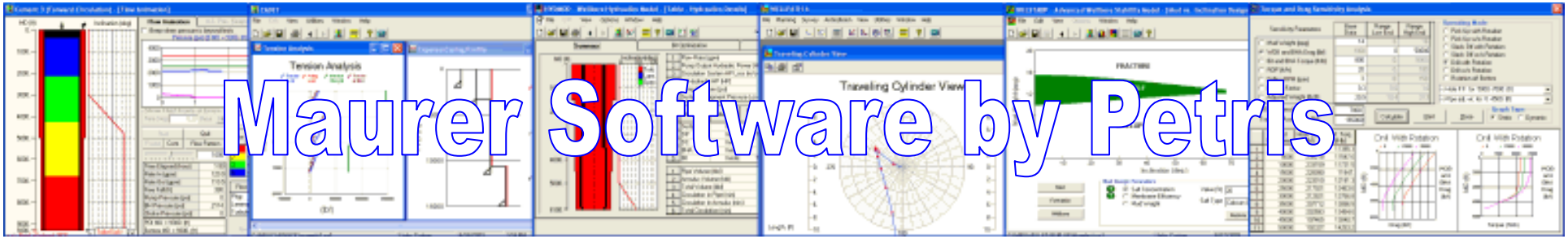
Similarly, the program calculates equivalent circulating density (ECD) versus time at the preselected depth of interest. This graph can also be shown with volume instead of time.



The **Flow Animation** window is a powerful tool for quickly checking several aspects of job design. The planned operation is simulated at a speed anywhere between actual time to 2000 times faster.



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.



Thanks for your interest in CEMENT

For more information on Maurer Software by Petris, email:

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or visit us on the web at

www.petris.com

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