Cementing Engineering Design: Calculations Made Easy
I. Challenges

Cementing operation success or failure can potentially make or break the financial viability of a well or project, so it is vital to correctly perform calculations and prevent mistakes during the design stage of a cementing job. As new technology evolves, the calculation of various parameters for cementing operations has become more challenging.

The following list highlights some of the common tasks in cementing engineering:

• Slurry volume
• Additive amount and cost
• Wellbore schematic
• Pressure differential
• “What if” or sensitivity study
• Professional report

Over the years, the industry has seen various calculation spreadsheets and technical documents. These spreadsheets have been used in the field and assist the engineers to perform engineering calculations. While being very popular, these spreadsheets have some drawbacks, which are listed here:

1. Limitation
   There are so many parameters in the cementing operation, especially in the complicated casing configurations, that cannot be easily handled by the Microsoft Excel® spreadsheets.

2. Error Proneness
   It is easy to modify spreadsheets. One engineer can create some cementing calculation sheets and before he knows it, every engineer in the team has their own version of the original one. While it is very easy to make modifications on existing spreadsheets, it is also very easy to introduce errors to the sheets, making calculation errors prone. This brings another issue, which is explained in the next item.

3. Non-Standard Application
   Because everyone can potentially change the calculation of spreadsheets, the calculation accuracy may be compromised. Spreadsheets may not be a good way to standardize the calculation across the engineers.

4. Drawing of Wellbore Schematics
   Spreadsheets may be able to draw some wellbore schematics, but making the schematics reflects that the dimensions of the input data could be very challenging.
II. Solution

Both operators and cementing companies desire to develop a standardized software tool, which would assist engineers and foremen, and raise the quality of work.

Pegasus Vertex, Inc. (PVI) and an US operator jointly developed CEMVIEW, a comprehensive cementing engineering toolbox software. This easy-to-use software incorporates the operator’s Global Best Practices for Cementing Operations. The goal of this software is to allow users to quickly and accurately perform the calculation through visual, sometimes animated schematics with cementing positions. In one session, users can create a variety of realistic combinations of casing/liner strings for land or offshore wells.

CEMVIEW can perform the following tasks:

• Scalable calculation for basic volume as well as for material and cost
• Database for business unit (BU) and vendor containing materials and cost
• Expandable pipe database
• 3D well path visualization
• Pressure calculation
• Casing and wellbore diagram with cementing positions
• Sensitivity windows help users to study “what if” scenarios without having to run multiple cases
• End-of-well report (Microsoft Word®) for e-mail distribution
• Land wells and offshore wells

CEMVIEW can automatically generate end-of-well reports with the wellbore schematic. The input data file can also be emailed to other engineers for users to open and make modifications.

Since its release in 2006, CEMVIEW has been servicing both operators and service companies worldwide.
III. Benefits

Being a standalone and standardized application, CEMVIEW eliminates the time consuming and error-prone practice of separate spreadsheets and creates consistency between all engineers. The benefits CEMVIEW brings to cementing engineers include:

• Standardized application
• Consistency between all engineers
• Clear schematics
• Simplicity
• Costs calculated quickly
• Sensitivity study on uncertainties
• Save time and reduce risk

These benefits come as the results of the carefully designed features of CEMVIEW.
IV. Features

1. Various unit systems and user logo selection
2. Survey data and 3D well path visualization
3. Schematic and cost summary
4. End-of-well report
5. Balanced cement plug
6. Pore and fracture gradient
7. Sensitivity study
8. String wizard
9. Additive database

1. Various Unit Systems and User Logo Selection

Users can select US oil field, metric or any combination of units. Logo can be selected and displayed on screen and report.
2. Survey Data and 3D Well Path Visualization

Survey data can be manually input, copy-pasted from Microsoft Excel® sheet or imported from text file, or even PDF® file. Then a 2D or 3D well path can be plotted.

Casing Explorer contains a list of all the casings for the well. When the well is selected, the right panel displays the casing summary.
3. Schematic and Cost Summary

“Output” tab displays the wellbore schematic and breakdown costs for all the casing strings in a well.
4. End-of-Well Report

CEMVIEW is smoothly integrated with Microsoft Office® in generating end-of-well reports. Each string has its own page summary.
5. Balanced Cement Plug

CEMVIEW calculates the volumes for balanced cement plug.
6. Pore and Fracture Gradient

Pore and fracture gradient can be plotted with the mud weight.
7. Sensitivity Study

Sensitivity study helps users to study “what if” scenarios without having to run multiple cases. This sensitivity study on TOC lets users see casing, cement schematics and pressure differentials at various top of cements.
8. String Wizard

String Wizard guides users step by step to construct a well. Users can view the casing and well schematic as data are entered.
9. Additive Database

Users can set up different business units and prices of additives in various regions. The database allows users to calculate the amount of material required and cost for additives.
V. Conclusion

Approved and endorsed by a major US operator, CEMVIEW aims to standardize cementing engineering calculations. Having a standard software application provides consistency and confidence in results and helps reduce unnecessary errors which could jeopardize cementing operations.

For more information on CEMVIEW, please contact PVI at:

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