

StimPlan - A Complete Well Database !

Did you know? With the upcoming release of StimPlan Version 5.10 (4th Quarter 2002), *StimPlan becomes a COMPLETE WELL DATABASE!*

With today's electronic data collection/archiving, petroleum engineers are overrun with data, at the same time finding less time to efficiently utilize this wealth of information. Then, once the information has been accumulated and utilized for this well – what about the future? What if, when we start preparing the next well, one wishes to “look back” and compare. Then, either we dig through files for paper log copies, etc., and/or become proficient in multiple software packages for handling logs, production data, well test data, frac data, With these multiple software packages, we must then keep multiple data files organized and stored, and in some cases, even individual programs require multiple, separate data files for frac data, measured pressure data, etc.

Typical Data

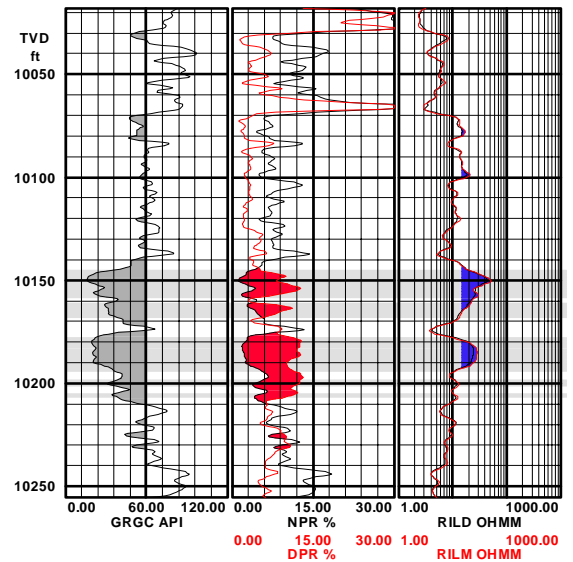
For example, planning/designing a proper fracture stimulation will involve well log data up front. Where is the pay, how thick is it, what is the quality, etc.? Next, there may be pre-frac production data and/or well test data, and this must be recorded/analyzed/filed. A preliminary treatment schedule must then be designed based on input data for geologic layering, rock properties (in situ stress, modulus, etc.), fluid loss behavior, proppant k_{rw} data, etc. Obviously, this must be saved!

Prior to the fracture treatment, additional data may be acquired to improve the treatment design. This may include stress tests, mini-frac tests, etc. Again, more data to record, analyze, and store. Then, actual treatment data (rate, pressure, proppant concentration, etc.) is important for post-analysis and future comparisons, and should be saved. Finally, there will be post-frac production data (and possibly well test data) that should be monitored, analyzed, and saved. Whew!

Well, **StimPlan** is here to handle/analyze/store **ALL** of this important data, all with one easy-to-use interface. This allows improved well performance as it becomes easy to review past triumphs & disappointments, look for comparisons, and insure Continuous Improvement.

Well Log Data

StimPlan imports multiple log tracks and allows smoothing, depth shifting, etc. – all the routine log handling needed for convenient use. Multiple “pay criteria” can be set to identify pay sections as seen below. Finally, this multiple log view is used to specify the geologic layering for fracturing analysis.



Pre-Frac Well Test Data

Permeability is possibly the **MOST CRITICAL** design parameter for hydraulic fracturing, and the best way to determine this is from pre-frac well tests (i.e., pressure build-up data). StimPlan includes basic tools for importing/storing/analyzing well test data as seen in a Type Curve Analysis for a pre-frac flow/build-up test (seen below).

StimPlan User Courses are being presented. These one-day courses are designed as hands-on interactive instruction on the application of StimPlan and E-StimPlan to solve many of a petroleum engineer's stimulation design and analysis problems. The objective is to maximize our user's ability to solve completion and stimulation problems using the “Five Function” approach of the StimPlan software package. These 5 functions, which should form the basis of any fracturing software are: **1) Data Analysis** including the ability to handle and analyze fracturing pressure data and post-frac production data, **2) Fracture Geometry Model** (while an important part, it is only one of the 5 essential functions), **3) Economic Analysis** in order to determine what type of treatment is desired based on realistic data and numerical fracture/reservoir/economic simulations,

4) Automatic Pump Schedule generation to eliminate wasted trial & error data input to arrive at a final pump schedule, and **5) Production Analysis** (type curve analysis and numerical reservoir simulator production history matching) for post-frac oil/gas rate production analysis. If you are interested in hosting/attending one of these interactive courses, please contact us at StimPlan@nsitech.com.



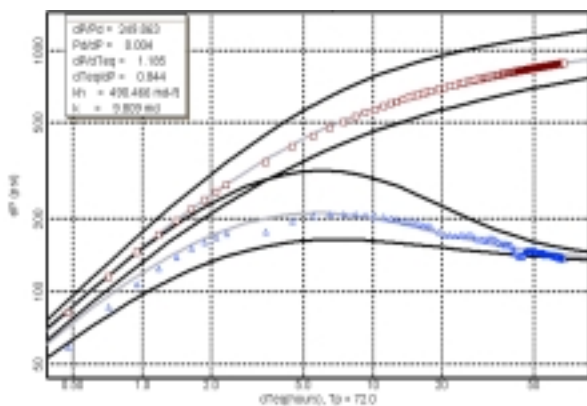
StimPlan / E-StimPlan Development Features & Plans

Development	Status	Target
Build database files of "Formation Types", properties, etc.	Version 5.00	
Measured Depth/TVD Option	Version 5.00	
3D Reservoir Production Simulation including Non-Darcy Flow & Stress Dependent Permeability/Fracture k_{wf}	Beta	1st Qtr, 2003
Multiple Log Track Handling	Beta	4th Qtr, 2002
Well Test (Pressure Build-Up) Analysis	Beta	4th Qtr, 2002
Fracturing Pressure Decline Analysis for Permeability, "k" ("Pre-Closure", Ispas, et al and "Post-Closure", Nolte, et al)	Beta	1st Qtr, 2003
Upgrade "k" Analysis above by coupling to Frac Geometry Model to Allow Time/Pressure "Stiffness" Variation	Future	
E-StimPlan - Upgrade to "Fully" 3-D Geometry Model	Version 5.00	
E-StimPlan - Completely Coupled Fracture Geometry/Reservoir Model including Poro- & Thermo-elasticity effects	Beta	1st Qtr, 2003

Finite Element Analysis

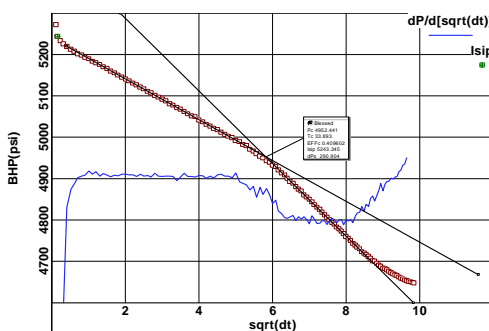
Did you know that E-StimPlan (& E-StimPlan 3D) is the **ONLY** fracture model to use rigorous FEM (finite element methods) to compute fracture width in layered formations? In such formations, normal calculations based on some average modulus easily miscalculate frac width by 50 to 100% or more. See SPE 71654 for more details.

Check our web site — www.nsitech.com — or visit our booth at the SPE Annual Meeting in San Antonio (October 2002) for more information.



Pre-Frac Fracturing Pressure Data

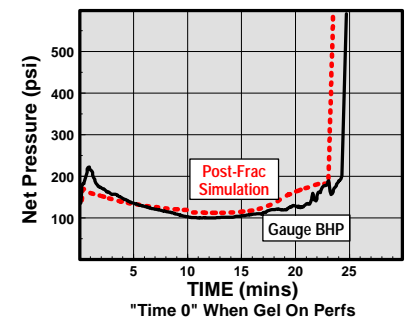
StimPlan has always included comprehensive capabilities for importing ("real time" or for post analysis) pressure/rate data for analysis of pre-frac tests. This includes extensive, incomparable capabilities for importing raw data from multiple sources, deleting unwanted data, "thinning" the data where second-by-second data is not required, then shifting data (from separate sources) in time before "re-sampling" to produce a final, integrated dataset for analysis. A comprehensive set of analysis plots is then available for complete analysis.



Frac Data

Of course, data from an actual frac can be imported (real time or "post"), and actual pump schedule (rate, proppant concentration,

etc.) data easily set up for post-frac simulation & analysis. The figure to the right illustrates an example of this for a frac-pack in a high permeability formation. A rate slow down (caused by surface mechanical problems) apparently triggered a total screenout, and this was correctly predicted by post-frac simulation. While not a desirable event, at least this confirms the geologic model used for treatment design, and thus will improve future treatments.



Post-Frac Production Data

Finally, after a successful frac post-frac production should be recorded, monitored, and analyzed, as this is usually the most cost effective means for measuring fracture effectiveness (since the data is free!). StimPlan includes comprehensive facilities for recording, storing, displaying, and analyzing this production data. One feature is the use of the 3-D numerical reservoir model for detailed post-frac production history matching as seen in the figure below.

