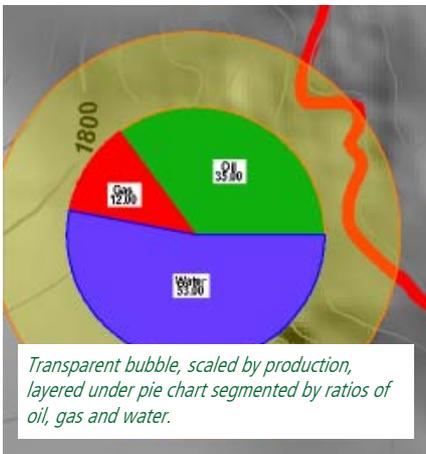


Exploring with Bubble Maps

Bubble maps are a great way of mapping production, fluid property, and other well information from the many data sources accessible through Petrosys direct connections.

dbMap's bubble map functionality, accessible to all Petrosys users through the pseis_db¹ menu, is an advanced superset of the bubble maps originally developed for use with Petrosys culture files.



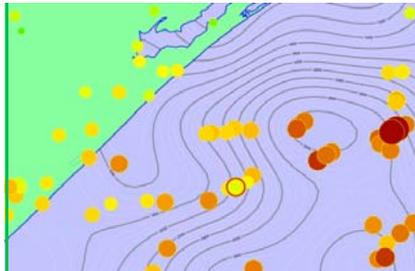
You can create Petrosys bubble maps from most of the EP well data stores that work with Petrosys, as well as from text data files directly. Point groups in culture files can be used, or you can directly access CSV and other column based data files. Bubble maps can be created both from well header and from zone based data in the Petrosys well data file.

Any single bubble map layer that includes more than one attribute to be graphed will automatically be drawn as a 'pie chart', with the numeric values of each attribute being used to work out the proportion of the 'pie' allocated to that attribute. You can include a formula to compute appropriate derivatives. For example, you can complement water saturation (SW) with a formula such as $(100-SW)$ for the hydrocarbon saturation.

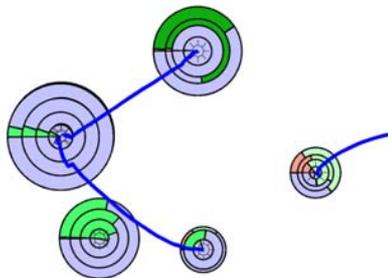
Bubble sizes can be scaled either on diameter or on area, and compare the sum of the mapped parameters against a user specified reference value and size. Area scaling is preferred for visual correctness.

¹ Visit our website www.petrosysguru.com for technical details on implementing a pseis_db menu.

To convey an additional dimension of information you can make the segment colors dependent on the attribute values via a color gradient or range.



Bubbles from a well data file using the total depth both for scaling and to select a solid fill color.



This map is created by overlaying five separate bubble map displays, each of which is based on production information for one year, using absolute oil production to control the green coloring.

Query Templates for Database Bubble Mapping

Spreadsheet templates are dbMap query structures used to expose the wealth of information in EP databases as a matrix view suited to bubble maps.

Managed using 'Admin/Reports/Templates/', templates are collections of simpler queries linked through common fields such as the UWI.

When executed, the template returns a matrix view of data that contains the attributes that can be selected for bubble scaling and coloring. A 'Preview' button next to the template selection in the dbMap bubble map dialogue lets you see the actual data.

Database performance has been an issue with some complex bubble maps. Petrosys now have a number of alternate query strategies that may be relevant to bubble map production in your environment, and will be happy to share these with dedicated bubble map users.

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Balancing Quality and Functionality

At Petrosys we'd love to provide you with fast response to your software change requests, whilst still delivering these with the stamp of approval of comprehensive pre-release testing.

Testing and quality control is increasingly controlling the pace of much of our software release cycle. Good quality practices in software development reduce the overall cost of developing a function by ensuring that the initial deliverables are much closer to a final robust product. They also ensure that our staff spend less time in the dreaded '95% complete' stage of the development cycle where poor design decisions or coding practises result in unforeseen issues and bugs.

Designing Provable Software

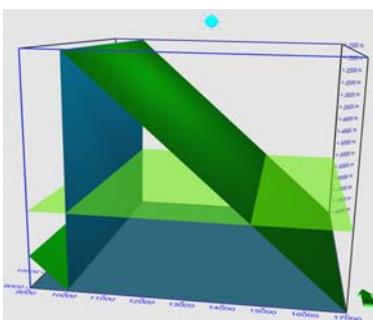
Our quality process includes designing our software, where possible, in a modular manner that minimises the risk of new functions creating problems in existing ones. Excessive modularisation can lead to fragmented user interfaces, so there will be occasions where we chose not to localise functionality, and a change in one function triggers an unforeseen change in another.

Writing Quality Code

Our developers follow coding standards and practises that are suited to the technical nature of our application. Standardisation in style and naming are important to ensure that developers can read, understand and modify each other's work.

Peer-based 'code review' meetings provide feedback on how a developer's work ties in with company standards and industry expectations. The code review process helps identify defects and raises suggestions on better ways of doing things.

A rigorous source and version control system ensures that developers are accountable for published code, and allows changes to be identified and wound back if necessary.



Testing Effectively

Once a function has been deemed 'ready for testing' by a developer, it goes through a formal testing process by designated software testers, who are typically staff seconded for testing from support, training or marketing roles. Support staff add value through their knowledge of EP workflows, and marketing staff through their focus on the functional extents of the software.

Our development task list tracks the testing status through to the release stage.

Designing a test process is an interesting task. Tests of technical applications need to do more than just prove that the input creates the right output:

- Accuracy** - does it produce the right answers
- Performance** - is it fast enough
- Stability** - does it crash
- Backwards compatibility** - will it work with old data

- Usability** - is it easy to understand
- Feedback** - does the option provide useful progress, status, result and error reporting.

Covering all these aspects is the challenge for dedicated software testers. A good software tester could be a geoscientist, IT person, or just a meticulous puzzle solver!

An effective test procedure also needs to be able to be run in a reasonable time frame and with reasonable computing resources, and to be set up in such a way that all parts of the test, including the end, are equally likely to be run on a regular basis.

The test process needs to address these issues in a balance that reflects business priorities. Infrequently used technically specialised functions need to focus more on testing accuracy, backwards compatibility and stability; heavily traversed tasks such as front menus need to be tested extensively for usability and feedback; and 'core' functions such as our new coordinate reference system need to be tested for unforeseen side effects.

Challenging the System

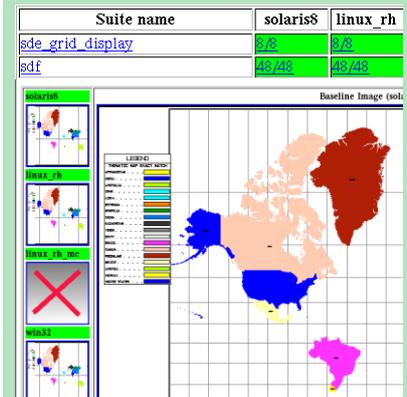
Our testing team strives to create a deliberately harsh environment to help identify software faults.

Petrosys builds and tests its' application nightly on Windows, Solaris, Linux, and on Irix from time to time, giving us the benefit that of finding errors that manifest themselves more strongly on one or another system. 'Memory dirtying' functions are used to help identify stray pointers.

For verification of algorithms and error handling we have to generate our own 'theoretical' data sets such as this faulted plane.

The Petrosys Batch Test Framework

Most nights of the week our computers run through an extensive series of standard maps and gridding workflows under a range of operating systems, and automatically compare the results to standard results to identify errors or changes.



For map tests, the maps produced on the various platforms can be displayed along with the baseline case, and a map of the differences (on a pixel base) shows up any software changes.

In addition to the many operating systems variants, our tests also have to cope with versions of Oracle and the many third party connectivity kits that we work with, and to validate backwards compatibility in data files.

Beta Testing at Client Sites

Once a release has passed the 'in-house' testing phase then we like to run it through some beta tests at client sites, to test against real implementations of third party systems and on typical computing configurations. Our larger sites often have a pre-release test process of their own in which Petrosys can be updated on a trial basis before the company commits to the upgrade.

Test Data Sets are Critical

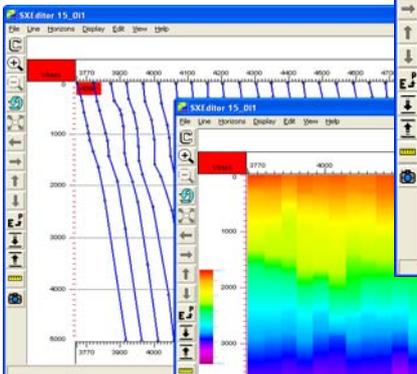
To test all aspects of an application it's important that test data sets exercise the functionality not only in a range of typical environments, but also in resource limiting situations, numerically verifiable 'perfect' situations, and deliberately 'broken' situations. Our test data environment spans some 85 individual Oracle databases and 100Gb of test data, excluding any seismic traces or velocity volumes.

Typical 'real-world' data sets are exceedingly important to us and very difficult to come by, and your contributions would be welcome. If we test on data that is typical to your workflows, you are more likely to get software tailored and tested to your business!

Drawing Velocity Sections

One of the unique features of Petrosys is the ability to work with seismic stacking velocities. In focusing on map based analysis, a lot of geophysicists may not be aware of the various types of velocity section that can be produced with Petrosys.

Stacking velocities can be displayed in the Petrosys section editor, which is accessed by selecting a line in the project editor, clicking on the 'section' icon, then using Display/Profiles to select the inclusion of data type Velocity/VRMS on the section.



Stacking velocity profiles displayed as profiles and colors.

The Display/Preferences/Velocity option then allows selection of either profile or color display modes.

To just find lines having stacking velocities in the seismic project editor, use the option 'Select/Data-Content' and the data type VRMS velocity within that.

Iso-velocity Diagrams

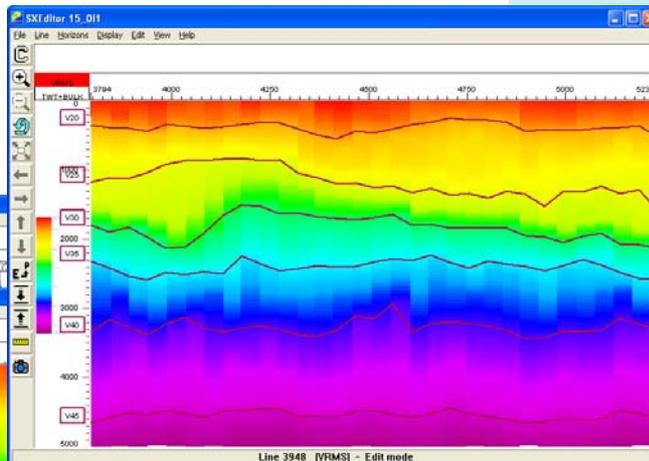
An iso-velocity section is one that lets you see areas of equal velocity, for example by drawing 'contours' of a given velocity map on a section.

You can construct iso-velocity lines on Petrosys seismic editor sections, provided that the velocities in your data always increase in depth.

To do this on a seismic data file (SDF) on which you have already loaded stacking velocities, you invent a series of 'placeholder' horizons for the various iso-velocity levels, then use the Petrosys seismic velocity options to compute the two-way-times to their fixed velocity values.

First, use the edit/horizons option in the project editor to define a sequence of horizons, one for each level at which you'd like to have an iso-velocity line. For example, you might invent horizons such as V20, V25, V30 to record the times at which velocities 2000, 2500 and 3000 m/sec occurred.

Now use the Petrosys main menu option 'Seismic/Velocities' to compute on stacking velocities, picking the computation



Isovelocity lines on section.

method 'Compute velocity slice - assign to TWT horizon'. Run this option successively for each of your required iso-velocity levels (eg. V20, V25, V30, ...) nominating the appropriate velocity slice value (eg. 2000, 2500, 3000, ...) for each pass. This will interpolate the times at which those velocities are found from the stacking velocity data to the specified horizons.

Improving Velocity Data Exchange

Petrosys are collating ideas on how to describe the data model for stacking velocities for possible refinement of the PPDM data model and publication of an associated XML interchange standard. If you'd like to give us some feedback on this, even in the form of providing some time for an interview, then please email support@petrosys.com.au noting your

interest in participating in the velocity data initiative.

To display the iso-velocity section, all you now need to do is to get back into the seismic section editor and use 'Display/Profiles' to add the data type TWT to the display, which will draw the two-way-times to the selected velocities on the section.

Interpolation Issues

Creation of velocity sections involves interpolation and extrapolation of velocity data. For best results set the File/Preferences in the velocity computation to 'Linear', and avoid computing iso-velocity layers that require extrapolation in time. See www.petrosysguru.com for more details.

Is Your License at Home?

With the rapid globalisation of local area network access, it has become technically possible for people in most major centres to connect at high speed to computer networks elsewhere in the World.

In some cases, this means that Petrosys licenses intended for use at a specific site may become technically accessible from places at which their use has not been authorised.

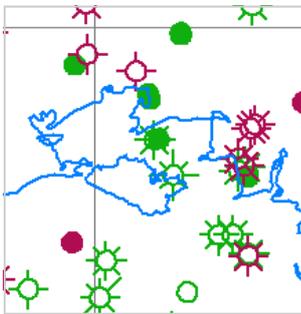
Unless your Petrosys license has been specifically negotiated to apply beyond the physical constraints of a given geographic location or to run on a given piece of hardware, you may be violating the terms of your Petrosys license by accessing it from a distant location such as an international office. If you are in doubt or would like to ensure that you have valid access to your Petrosys software from a range of locations then please call your local Petrosys office.

Streamlined dbMap Queries

Have you ever wanted to color the symbols of SMT wells posted in Petrosys based on their total depth? Or Grid the top formation for a specific OpenWorks Interpreter?

These are just two examples of what is instantly achievable by means of the pre-defined standard query suite which has been shipped with Petrosys since version 14_6. A new library of queries was created that was more comprehensive, easily updated and simple to use. With each successive release of software new queries will be included and the old ones updated with new features as required.

At present the standard suite includes 175 Openworks queries, 334 dbMap queries, 37 Geoframe queries, 66 Finder queries, 38 SMT queries, 34 Geographix queries and 82 Intellex queries. 130 of these queries use the new user-friendly lookups for run-time selection of things like interpreter name.



Queries which use Lookups and Prompts are denoted with a ... at the end. Queries have been given a consistent naming convention, for example to post any generic well header in formation, queries are prefixed with **Hdr:** whereas to post any depth information, queries are prefixed with **Depths:**

The new queries are easy to recognize as they have the owner of DEFAULT. They have been made read only so that Petrosys can update them reliably. You can use Save As to create local variants of the query.

In this example wells are annotated using standard queries **Hdr: Names: Well Name** and **Depths: Total Depth**, and thematically mapped using the standard query **Misc: Thematic: TD wildcard in color**, which provides a runtime prompt for the TD specification. In this case pink is used to represent wells deeper than 2100m.

A more detailed walkthrough of the thematic query used is available on www.petrosysguru.com.

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Do you have an interesting story to share with our readers?
 Email us at info@petrosys.com.au and tell us about your experience in the wide world of Petrosys use.

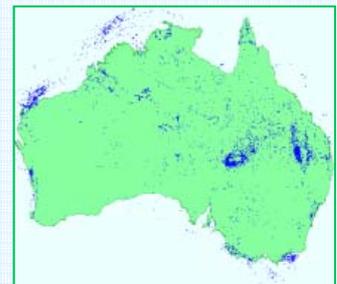
Free Australian Well Data

If you're after a 'starter kit' of well location data for your Australian exploration efforts then a readily accessible source is the Geoscience Australia (GA) public web site.

From the GA wells web page <http://www.ga.gov.au/oracle/apcrc/> you can elect to download basic well header information for over 11,000 petroleum wells in Australia.

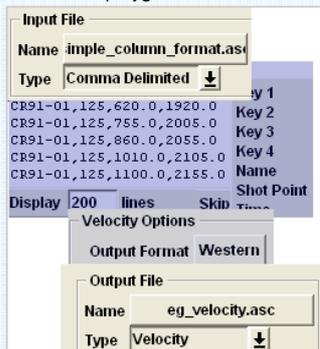
The data is formatted for immediate loading into a cul file. A predefined format for loading of this data set to a well data file can be downloaded from petrosysguru.com under the 'Tools' section.

The GA wells page also allows downloading of scientific well data in text format. Formation stratigraphy, reservoir and facies data, source rock, maturity and other geochemical analyses, biostratigraphic data and other data sets are available for many wells. Listings of physical holdings (seismic tapes, well logs, cores and cuttings), ordering facilities for tapes and reports, and all other GA databases are also available at <http://www.ga.gov.au/oracle/npd>.



File Conversion Utility

Do you have to deal with a never ending succession of differing file structures for velocities, polygons, faults and contours?



A neat Windows based file conversion utility can now be downloaded free from the Tools section on our petrosysguru.com web site. This tool understands many of the spatial and geophysical file structures used by Petrosys.

The tool browses the input file that you point it at, interpreting data into columns based on your selection of a fixed format or a range of delimited format structures. If the file has a simple record layout, you then simply paint the columns in the browse window and select the associated data in the output file type that you are trying to create. Files with multiple record types are also supported.