



Software developed by oil major available at no cost

With “membership,” comes privileges



Wilson

Ryder Scott clients now are eligible to receive free user licenses for five highly advanced oilfield software programs developed by an oil major. The SOS (Specialized Oilfield Software) suite, now

owned by Ryder Scott, will ultimately comprise nine programs, but four are not ready for release.

“The word ‘free’ usually means the offer is either of little value or has strings attached,” said Ron Harrell, CEO at Ryder Scott. “However, our offer is unique. The SOS programs are very beneficial to reservoir evaluators,” he said.

Harrell explained that because Ryder Scott is not a software company, it is not feasible to sell the programs. “We have no plans to get into the petroleum software market. As consultants, it is not our core business,” he said.

The firm still anticipates a reciprocal benefit from the pro bono program. “Implied in our understandings with users is that they use our consulting services,” said Harrell.

The SOS suite will comprise the following software programs.

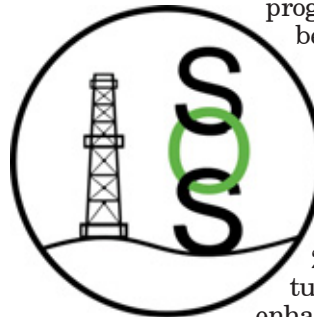
- Snap nodal analysis package
- ProCast gas deliverability modeling system
- PTA pressure transient design system

- Forecast decline curve program
- Epec Excel-based petroleum engineering functions
- Tank graphical material balance program
- BubbleMap map-based graphics
- Patternflood waterflood pattern balancing
- Beampump sucker rod pumping program

By June, Ryder Scott had beta tested five SOS programs that met standards for commercial quality — Snap, ProCast, PTA, Tank and Forecast. Scott Wilson, petroleum engineer at Ryder Scott and the primary developer of two of the applications, continues to develop and refine the remaining four programs.

Over the past two years, he and a small group of early adopters worked back and forth over the Ryder Scott Web site to enhance the SOS software.

Originally, a U.S. oil major developed the Windows programs during a 12-year span beginning in 1988 when the industry started to migrate mainframe engineering applications written in Fortran to PC environments in C and C++.



The company granted rights to the programs in 2000 to Ryder Scott, which, in turn, agreed to maintain and enhance the software and provide

copies as needed.

“It’s a mutually beneficial relationship,” said Wilson. “They no longer wanted to support internal programs and I just hated to see all that hard work discarded.”

Wilson brought the SOS applications to Ryder Scott when he joined the firm two years ago. His background as a petroleum engineer enabled him to design the programs so they are flexible enough to accommodate field-specific engineering needs.

“By the late 1990s, several software firms standardized their Windows-based engineering programs, so rapid enhancements and customization for any one client were no longer possible,” said Wilson. “The few internally developed Windows-based applications, such as our SOS programs, provide a means to propagate technical advances without the red tape involved in user-group activities and in the long lead times typically required for enhancements to shrink-wrapped software.”

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Unconventional U.S. gas resources could stave off shortages, but technical hurdles persist, says Hodgin

Industry is hearing the same message about clean-burning natural gas. “The oil century has ended and the future belongs to gas,” says *Reuters* analyst Andrew Callus. “The natural gas revolution is coming,” says Michael Economides, a professor at the University of Houston. He predicts that gas will constitute 40 to 50 percent of the world energy mix by 2020.

But even as demand for gas is set to explode in the 21st century, some significant problems on the supply side will have to be overcome in North America, if the domestic industry expects to reap the benefits, said Ryder Scott executive vice president John Hodgin.

He cited figures showing that demand in the United States is expected to be 35 Tcf per year by 2020 — 5 Tcf more than the esti-

mated supply. To meet demand in 2020, imports will have to be increased from their current 19 percent of gas consumption to 22 percent, said Hodgin.

“It is encouraging that the U.S. has added significant gas reserves since the mid 1980s, but future demand will outstrip the domestic supply unless other higher-risk unconventional sources are tapped,” he said.

The Gulf of Mexico, which has produced longer than any other offshore area, will continue to be a major contributor of gas, said Hodgin. However, more gas supplies have to come from coalbed methane (CBM), tight gas reservoirs (15,000 feet or more), gas shales and the deepwater Gulf of Mexico. Other future gas sources from emerging trends include deep CBM, gas hydrates and sub-volcanic plays in Washington, Oregon, Idaho and Wyoming.

“In 2020, unconventional resources could supply 8.51 Tcf per year—more than enough, when combined with conventional re-

sources, to meet U.S. demand,” said Hodgin.

The challenges are formidable though. Producers will have to drill into CBM deposits below 5,000 feet, which is deeper than currently produced.

They will also have to develop sub-volcanic plays that are hard to delineate with 3D seismic technology. Also, it will be no easy task to produce gas-hydrate deposits, a frozen sludge of gas and water formed by pressure and cold in depths at and below the ocean floor.

“It will be very difficult to develop the technology and find the skilled personnel necessary to develop unconventional sources,” said Hodgin. “About 400,000 U.S. jobs were lost as a result of the 1986 bust and those personnel were never replaced.”

He also concluded that LNG imports alone would not bridge the supply-demand gap. Tom Talley, a contract geologist at Ryder Scott who conducted research into gas supplies, said, “A huge revelation is

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Publisher’s Statement

Reservoir Solutions newsletter is published quarterly by Ryder Scott Company LP Petroleum Consultants. Established in 1937, the reservoir evaluation consulting firm performs more than 1,000 studies a year. Ryder Scott has issued reports on more than 200,000 wells or producing entities in North America. The firm has also evaluated hundreds of international oil and gas properties involving thousands of wells. Ryder Scott multidisciplinary studies incorporate geophysics, petrophysics, geology, petroleum engineering, reservoir simulation and economics. With 117 employees, including 66 engineers and geoscientists, Ryder Scott has the capability to complete the largest, most complex reservoir-evaluation projects in a timely manner.

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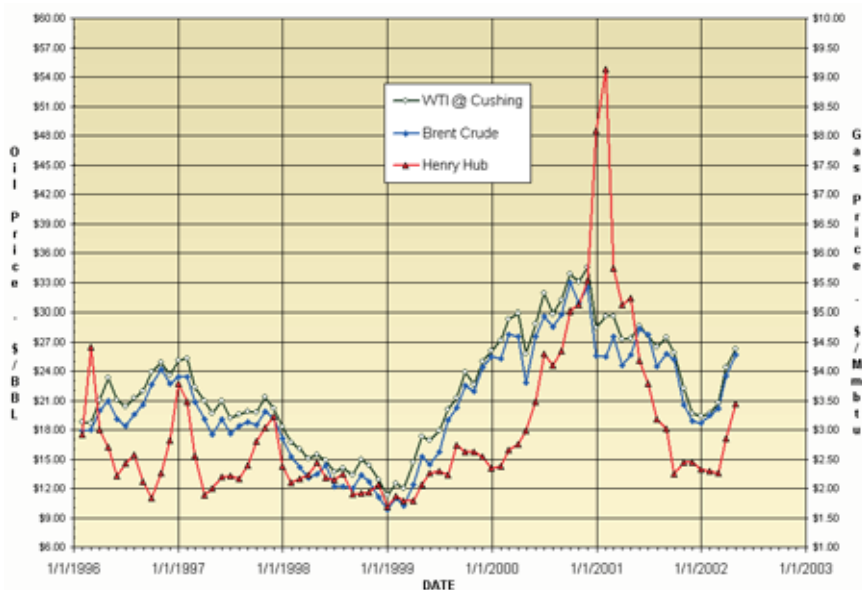
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Reservoir Solutions

Editor: Mike Wysatta
Business Development Manager

Ryder Scott Company LP
1100 Louisiana, Suite 3800
Houston, Texas 77002-5218
Phone: 713-651-9191; Fax: 713-651-0849
Denver, Colorado; Phone: 303-623-9147
Calgary, AB, Canada; Phone: 403-262-2799
E-mail: info@ryderscott.com
Web site: www.ryderscott.com

Price history of benchmark oil and Henry Hub gas



The historical price chart shows the monthly average cash market prices for the following: WTI crude at Cushing (NYMEX), Brent crude and Henry Hub gas.

People



Rains

Ryder Scott Vice President Dick Rains, petroleum engineer, retired in March and was honored at a reception at the Houston Club. Rains joined Ryder Scott in 1973 from Marathon Oil Co. where he was a petroleum engineer for 11 years. He began his career as an engineer trainee at Plymouth Oil Co. in 1956. Rains continues to do part-time

contract work for Ryder Scott.

The March *Journal of Canadian Petroleum Technology* published a paper on solution gas drive in heavy oil reservoirs written by Ryder Scott Canada petroleum engineer Rajneesh Kumar. The Society of Petroleum Engineers also published a Kumar-written paper, "An Investigation into Enhanced Recovery under Solution Gas Drive in Heavy-Oil Reservoirs" (SPE 59336) in the June *SPE Journal*.

The *Journal of Petroleum Technology* recently published the highlights of an SPE paper on reservoir simulation by Ryder Scott petroleum engineers Miles Palke and Dean Rietz, vice president and manager of reservoir simulation. A description of the full paper, "The Adaptation of Reservoir Simulation Models for Use in Reserves Certification under Regulatory Guidelines or Reserves Definitions" (SPE 71430), was published in the December 2001 *Reservoir Solutions* newsletter. SPE published the abridged version of the paper in the April *JPT*, Page 74.

CEO Ron Harrell said, "SPE carefully screens several thousand abstracts a year and publishes about

2,000 papers. From those, only 12 a month are published in *JPT*. This recognition is well deserved by Miles and Dean and appreciated by all of us at Ryder Scott."



This slide, representing the myriad of entities involved in reserves definitions, is one of several from Ron Harrell's presentations posted on the Ryder Scott Web site.

The following three recent presentations by CEO Ron Harrell are now posted in PDF format in the What's New section on the Ryder Scott Web site at www.ryderscott.com.

- Oil and Gas Reserves Determinations, API Federal Tax Forum, April 23
- Mutual Expectations of Consultants and Clients, SPEE Houston chapter meeting, May 14
- Petroleum Reserves Definitions, Anadarko Reservoir Engineering Systems Forum, May 15

Universities Using *Reservoir Solutions* Freeware*

Chiang Mai University, Thailand
College of the North Atlantic, Canada
Curtin University of Technology, Australia
Imperial College, U.K.
Istanbul Technical University, Turkey
King Fahd University of Petroleum, Saudi Arabia
Leeds University, U.K.
LSU, United States
Marietta College, United States
Middle East Technical University, Turkey
Petroleum University, Iran
Royal Holloway University of London, U.K.
Texas A&M University, United States
Texas Tech University, United States
Tulsa University, United States
University of Alabama, United States
University of Alaska Fairbanks, United States
University of Alberta, Canada



University of Boumerdes, Algeria
University of Houston, United States
University of Karachi, Pakistan
University of Mining and Geology, Yugoslavia
University of Oklahoma, United States
University of Texas, United States
University of Tokyo, Japan
University of West Indies, Trinidad
Usakti University, Indonesia
West Virginia University, United States

* This list represents universities with teachers and staff members who are registered users of Ryder Scott's *Reservoir Solutions* freeware. Many of those teachers make the software available to students and use the freeware in class projects. Approximately 2,000 freeware downloaders from 62 countries are registered with Ryder Scott.

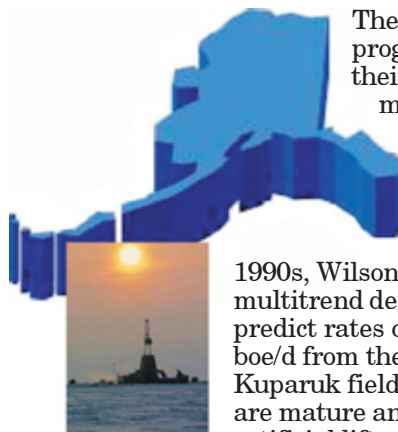
SOS—Cont. from Page 1

Some of the SOS programs have roots that go back to the 1970s when oil companies used internal staffs to develop engineering software on mainframes. “Although none of the original Fortran remains in the SOS programs, many of the comments, programmer notes and references are 25 years old and still exist in the source,” said Wilson.

The SOS programs are products of a cumulative effort in which developers added to the work of earlier developers. Wilson roughly estimates that the programs took 100 man years of development time.

“The most difficult challenge during that time was staying ahead of commercial programs,” he said. “During periodic reviews, the company evaluated commercial software and cut any internally developed applications that didn’t provide differential value. The programs, now maintained by Ryder Scott, survived those rounds of cuts.”

Snap to action: Trouble shooting at Prudhoe



The Snap and Forecast programs have earned their stripes as field management tools in one of the most prolific U.S. oil and gas provinces — the Alaska North Slope. During the early

1990s, Wilson and others used multitrend decline analysis to predict rates of more than 1 million boe/d from the Prudhoe Bay and Kuparuk fields. Now, those fields are mature and nodal analysis of artificial lift systems is essential to

maximize value from each well.

North Slope operators have tied Snap and Forecast to the Prudhoe Bay and Kuparuk field databases and use Snap to automatically troubleshoot gas-lift wells. Wilson worked closely with the operator to build the system and continues to quickly modify the software to accommodate changing databases and work flow.

“In contrast, many commercial artificial intelligence systems either do not get data from existing company databases or require operators to modify their systems to accommodate software,” he said.

Early this year, Ryder Scott struck an agreement with a global leader in artificial lift technology to integrate its jet pump technology into Snap. The impetus for that came from two operators that wanted to more accurately predict hydraulic jet-pump performance using their well-defined PVT and hydraulics relationships.

They were constrained by the PVT properties and hydraulics correlations written into the jet-pump software. To solve this, the service company gave algorithms used in its jet-pump modeling program to Ryder Scott, which integrated them into the PVT and hydraulics components of Snap. In exchange, the service company can use Snap in designs for clients.

“Ultimately, we hope that we help operators install

even more profitable jet-pump systems since designs will now incorporate their own extensive experience modeling their wells and the service company’s expertise in jet-pump design,” said Wilson.

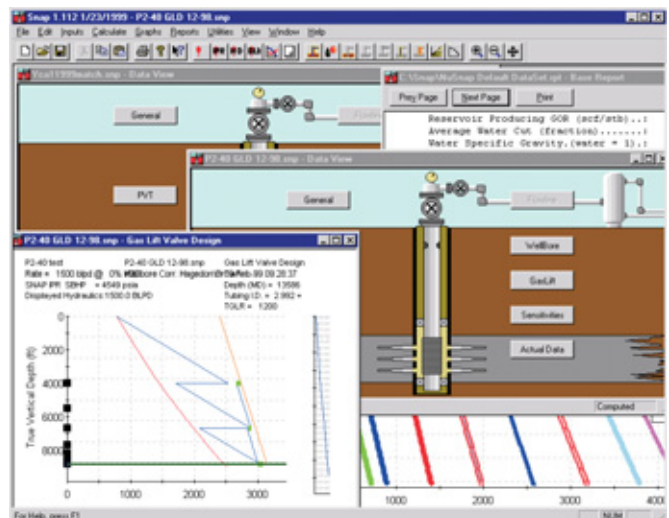
“... many commercial artificial intelligence systems either do not get data from existing company databases or require operators to modify their systems to accommodate software.”

These operators now use a dynamic system that models the drawdown capabilities of a jet pump, increases productivity through gas lift and carries out well surveillance through a full-featured nodal analysis system. Snap automatically retrieves new well-performance information, such as casing pressure and recent well tests, then screens the well for gas-lift performance problems.

To use this feature, the user just selects the wells of interest and launches the automated gas lift troubleshooter. Snap then retrieves the most recent descriptive data from the operator’s database, runs a gas-lift analysis and compares the results to the most recent measured well-test data that is also automatically loaded from the database.

If a well on the list is not operating at its peak — not lifting off bottom, experiencing unexpected back pressure or not producing at stable rates — the program flags the well in a sorted report and predicts the potential benefit from fixing the problem. If appropriate, the operator then chooses to rectify the problem or to investigate further. Snap also accounts for the backout effects that improving a given well may have on other wells.

“If the run is kicked off before the engineer goes home, by the next morning, he might have a list of 20 to 30 wells that require further attention and 400 wells



An engineer automatically trouble shoots all wells in a field working from this and other screens in Snap’s gas-lift module.

that the program predicts are running as designed,” said Wilson, who worked for Atlantic Richfield Corp. before joining Ryder Scott.

Originally, Wilson built Snap from Fortran legacy code developed by consortia, published technical papers and years of engineering programming work. “I am proud that the efforts of all these people continue to provide value,” he said.

Worldwide gas field management

The ProCast gas network and deliverability modeling system has proven itself in various international upstream gas projects. It is the first program of its type in a true Windows operating environment, not a DOS shell.



A coordinating engineer from one of the supermajors used ProCast for gas operations and exploration programs in the U.K. North Sea. “I found it to be a very flexible, efficient tool

to use in screening multiple gas field development scenarios,” he said. ProCast has allowed the company to analyze multiple combinations of reservoir, well and surface-facility options and to quickly generate production predictions for use in economic modeling.

The engineer said, “Model setup and forecasts were very quick and the results were robust enough to be used for our development-planning decisions up through the point where enough data were available to move into full simulation. All up, an excellent tool.”

Ryder Scott also used ProCast to set up a gas-well deliverability system for some Pecos County properties in the Permian Basin of Texas. The program factored in daily production rates, flowing tubing pressures at wellheads and collection points and quarterly bottomhole pressure data to predict complex gas field performance. “ProCast is a very handy tool — powerful, flexible and easy to use,” said Eric Hambly, a Ryder Scott petroleum engineer who worked on the project.

Wilson, who designed and wrote ProCast, said that its use saves time over other tools or methods. For instance, in two weeks, Wilson and Harris Ghozali, petroleum engineer at Ryder Scott, with the assistance of the client, built a complete, reliable working deliverability model linking the wells and gas-gathering network for seven fields in the Western Desert of Egypt.

Wilson also used ProCast for short-term well planning for China’s largest offshore gas field. Starting with a client-built ProCast model, Wilson

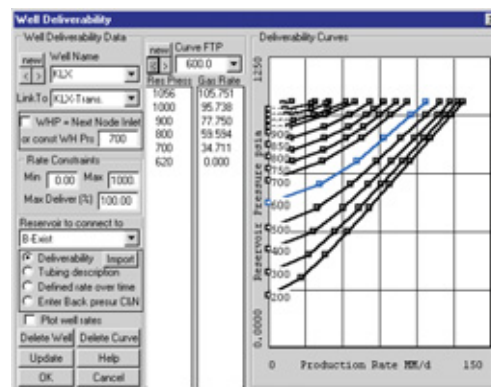


tuned it for two or three days to closely match deliverability data. He then ran the field model forward to test it and the predicted plateau dropoff matched the time period predicted by the much more complex simulation model.

Like other SOS programs, ProCast is often quickly modified to meet a project need, Wilson said. The field in China has 350 degree F bottomhole temperatures, so he incorporated an internal calculation to account for condensed water produced at various pressures and temperatures. “To account for this in simulation runs would have required using a fully compositional model or using post processing after the model run was complete,” said Wilson.

For coal-gas reservoirs, he added Langmuir parameters to define the coal-gas pressure and volume relationships, instead of the more common but not applicable P/Z curves used in other deliverability planning tools.

The true Windows operating environment for ProCast makes this tool intuitive and easy to use.



Tank: Powerful, easy to use

Tank is a powerful analytical tool for reviewing and predicting the reservoir and aquifer performance of combination-drive oil and gas reservoirs. It couples a general form of the material-balance equation with a choice of aquifer models to handle a wide range of hydrocarbon fluid types and reservoir drive mechanisms.

Ryder Scott recently used Tank to generate a material balance analysis of a Gulf of Mexico field for a super independent to resolve differences between volumetric estimates and estimates of oil in place. Mike Stell, vice president and petroleum engineer at Ryder Scott, tested Tank by entering data into the program and identical data into two leading commercial programs. All three generated the same answers, but Stell said that Tank was easier to use, citing the data-tree approach for information entry and ability to make computations from cut-and-pasted Excel data.

A complete suite

The nine SOS programs and eight Reservoir Solutions Excel-based utilities available over the Internet comprise what is inarguably the largest single-source of free, rigorously tested oilfield software in the industry. “These programs will enable competent reservoir engineering and field managers to

Please see SOS on Next Page

Ryder Scott helping out — one neighbor at a time

To help two elderly women in Houston, Ryder Scott employees made improvements to two houses on May 4 and 5 and donated more than \$2,000 to buy materials. Employees and their family members, 45 in all, volunteered through Sheltering Arms, a nonprofit organization that recruits volunteers to provide services to the elderly so they can live independently.

Gene Presley, vice president and geologist at Ryder Scott, initiated and led the effort. The employees split up into two teams — one to paint and do minor wood repair for one elderly homeowner; the other to build a wheelchair ramp for a disabled homeowner. They also worked much into the flowerbed and planted petunias at the painted house.

Antone's Deli and PoBoys at Summit Square donated 70 sandwiches to the Ryder Scott teams.



Ryder Scott employees and family (left) stand in front of the home before they painted it. From left (above), Jim Broome, Kirby Wells, Dan Olds and daughter Kendyl Olds stand at the top of a wheelchair ramp that they built. Also on the team, but not pictured, were Jason Broome and Tracy Olds.

SOS—Cont. from Page 5

evaluate upstream operations using both simple and sophisticated techniques," said Harrell. "We actually feel that some of the programs will become essential applications within many of our client companies while reducing their licensing costs by thousands of dollars a year."

Support, training and enhancements

On a case-by-case basis, Ryder Scott has and will continue to offer free and fee-based seminars and support so clients understand how to use the SOS tools. Wilson has taught a three-day ProCast class in Houston for Apache Corp., a three-day Forecast and Snap class for BP plc in Anchorage and plans to highlight both of the latter two programs in classes to be conducted for clients of OGC Training Inc.

Snap, ProCast, and Epec each have a set of Windows-based hypertext help files that are on par with commercial help documentation, said Wilson. However, the other programs need more extensive user documentation. "That's one of the reasons it's tough to get these other programs out the door," he said.

He expects that the intuitive interfaces built into the SOS programs, one-on-one consultation sessions and training classes will facilitate the learning process. "Ryder Scott will assist companies in understanding how the programs work, so that the tools are useful," said Wilson.

He plans to continue making minor enhancements to Snap by tuning the gas-lift troubleshooting module and adding rigorous multipoint gas injection. Wilson is also improving Forecast by fine tuning the interface and constructing a seamless link between the rate-cum and rate-time plots. These and future enhancements are driven by specific client needs.

"Because our focus is on consulting, we provide tools to our clients as part of our consulting service, but we don't plan to pour extensive internal resources into user support and documentation. These programs are a means to an end, and happily, we are successfully using them to help our clients meet their needs," said Wilson.

Sign me up, Scottie

Current and potential clients interested in further information on the SOS user licensing program should contact Wilson at 303-623-9147 (phone), 303-623-4258 (fax) or scott_wilson@denver.ryderscott.com (e-mail). He will provide a copy of the user agreement and licensing terms for review. Wilson also will provide trial versions of the SOS programs for "test drives." Distribution of the password-enabled software is handled through FTP transmission.

Editor's Note: Ryder Scott does not guarantee or warrant the accuracy or reliability of the SOS software and disclaims its fitness for any particular purpose.

Summary of Available SOS Software



The Snap™ well-performance application is a full-featured nodal analysis package. In many cases, Snap is simpler to use than some commercial programs because it

was built by end users for their own uses.

Snap is written in Microsoft Foundation Class VC++, an advanced programming language. Snap has the most complete and rigorous gas-lift-design, troubleshooting and analyses features available in commonly used nodal packages. The application is now the standard gas-lift package for engineers working both the Prudhoe Bay and Kuparuk oil fields.

Access to clients' raw data in Oracle and other databases eliminates tedious data entry. Snap has evolved through 10 years of intensive testing and design to a point where it meets most needs.

ProCast™ is the first gas network and deliverability modeling system available in a true



Windows (not a DOS shell) interface. ProCast makes designing and optimizing gas fields like "playing a video game," says one user.

ProCast pulls in performance data or creates it from reservoir and gathering system layouts. It then steps forward (and even backward) in time to show how well, for example, a new compressor meets deliverability needs in five years or the next day.

Designer Scott Wilson says that managing a complex gas field without ProCast is like driving a car with the windshield painted over – a driver may make it to the end of the road, but it will be an expensive, rough ride. He adds that ProCast has been a lifesaver to many engineers who had "hit the wall" trying to predict complex gas-field performance with other tools.



PTA™ is a pressure transient analysis and design system crafted through tens of man years of engineering and programming talent. The application is the most intuitive, yet full-featured pressure transient program in the industry, says Wilson. The graphical data-manipulation

features simplified straight-line models as well as the most complex multivariable regression solutions.

From the beginning engineer to the full-time tester, PTA will perform at the highest levels.

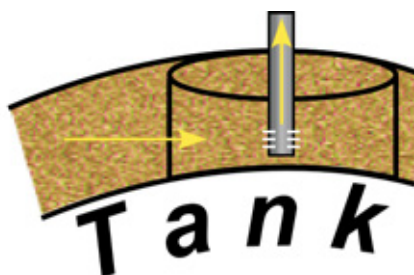


Forecast™ is the only decline curve program that integrates multiple trends to determine a constrained forecast, said Wilson. Most decline packages take the ap-

proach of plotting one phase and drawing a line through the data while ignoring all underlying reservoir, well, event and facility inputs that may have caused the particular behavior.

Some packages even attempt to model a well while only showing a single phase and then are "surprised" when a sudden decrease in oil rate flattens out because of an increase in water-handling capacity. Forecast accounts for water production trends, WOR vs. cum as well as GOR trends while forecasting oil rates.

The ability to take two independent trends, mathematically couple them through iterative procedures and arrive at a meaningful oil forecast is a key feature of Forecast. Engineers use the program to schedule gas-cycling wells at Prudhoe Bay and water-flood reserves worldwide.



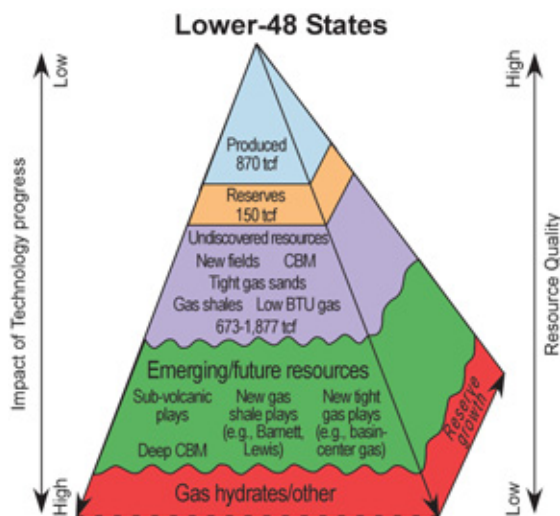
Tank™ is a powerful analytical tool for quickly reviewing and predicting the performance of oil and gas reservoirs. Tank incorporates an innovative data tree

approach for data entry where results are continuously updated as new information is provided to the program.

OOIP and OGIP estimates from several methods are compared and contrasted to understand the variance in the data. Integrated statistical analysis provides distributions of potential values that then can be incorporated into the new portfolio analysis techniques.

Tank couples material-balance concepts with a variety of analytical aquifer models, enabling it to handle a wide range of hydrocarbon fluid types and reservoir drive mechanisms. Given a reservoir's production and pressure history, a company uses Tank to estimate original hydrocarbons in place, aquifer size and strength and ultimately to predict future reservoir rates and pressures.

Gas—Cont. from Page 2



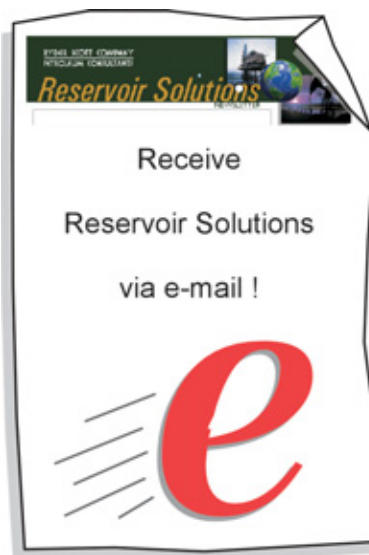
that LNG has a minimal impact on the overall U.S. gas market. Furthermore, the prospects for future expansion of the U.S. LNG market are impeded by regulatory issues.”

Hodgin explained that the combined supply from all future LNG projects, either proposed or currently underway for 2006 startup, could cause a 900 percent increase in LNG infrastructure and plant capacity in the U.S. However, U.S. LNG processing and transportation projects face tremendous local, state and federal compliance hurdles, he said. Add to that the competition from other consumers, including developing Asian countries, for LNG and the future of the U.S. LNG market is clouded. Hodgin made four recommendations:

- Infrastructure will have to continue to expand at current levels.
- Long-term investors must be invited back to the table.
- Stranded gas resources should be a priority.
- LNG projects must have the political and capital support to continue to develop as a viable resource.

E-newsletter now available via automatic e-mail

Electronic method to ensure timely delivery for international readers



Starting with the September *Reservoir Solutions* newsletter, Ryder Scott will e-mail a link to an electronic version for readers who request this service. To minimize file size, the e-mail will contain only a link to the Ryder Scott Web site, but no attachment.

In addition, the firm will discontinue sending hard-copy versions to readers who want only the PDF e-newsletter. Internet

access requires Adobe Acrobat Reader. A link to the Acrobat freeware is posted at www.ryderscott.com.

“We send the publication to our international readers via airmail, but it takes weeks to arrive. This delivery method is much more timely,” said Mike Wysatta, editor and business development manager.

To request the e-newsletter service and/or to discontinue receiving the mailed publication, please e-mail pam_kaplan@ryderscott.com.

Ryder Scott Co. LP
1100 Louisiana, Suite 3800
Houston, Texas 77002-5218
Phone: 713-651-9191; Fax: 713-651-0849
Denver, Colorado; Phone: 303-623-9147
Calgary, AB, Canada; Phone: 403-262-2799
E-mail: info@ryderscott.com
Web site: www.ryderscott.com

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