

RESERVOIR SOLUTIONS

Published quarterly by Ryder Scott Co. LP July – Sept. 2017 / Vol. 20, No. 3



13th Annual Ryder Scott Reserves Conference

Sept. 21st

Ryder Scott Conference
– See Page 2

TABLE OF CONTENTS:

13th Annual Ryder Scott Reserves Conference.....	2	Geologist joins RS, seven employees promoted.....	7
High-side forecasts with type wells caused by “survivor bias,” says Lee.....	5	New approaches to type-well analysis put to the test in Cardium play.....	8

13th Annual Ryder Scott Reserves Conference on Sept. 21st

Experts at RS reserves conference to update industry on several fronts

Whether private or public, big or small, well-funded or not, E&P companies in the U.S. oil patch are narrowing their targets to shale properties that remain economic at sub \$50-a-barrel oil. They are also focusing on conventional reservoirs using advanced drilling-and-completion (D&C) techniques.

A current assortment of major E&P players and their stories will be on display at the 13th Annual Ryder Scott Reserves Conference in Houston this September. Please see schedule and agenda on opposite page.

Better approaches in the reserves-evaluation sector will be featured at the conference. Traditional type-curve analysis, a decades-old, time-efficient method to estimate EURs from hundreds or thousands of wells, is getting a new name and makeover.

Please see articles on type-well analysis on pages 5 and 8, as summarized from the Ryder Scott Canada Reserves Conference last May. Both of the respective speakers — **John Lee**, professor at Texas A&M University, and **Vitaliy Charkovskyy**, a senior petroleum engineer at Ryder Scott Canada — will present at the Houston conference.

Organizers anticipate a full house of almost 400 at the Hyatt Regency hotel in downtown Houston, Thursday, Sept. 21, which would make it the largest-ever single gathering of senior reserves evaluators, eclipsing last year's attendance.

Alpine High raises spirits

Independents as well as majors are exploring and finding unconventional resources with potential production and cash flows that promise to exceed target returns. Expertise and organic growth through the drillbit will never go out of style.

The Alpine High field — a confirmed discovery last year in a relatively unexplored area of the Delaware basin in the Permian — is a headline grabber. Apache Corp. initially estimated that hydrocarbons in place to be 75 Tcf of gas and 3-billion BOE in the Barnett and Woodford formations alone. *Please see Reserves Conference on page 4*

Brandon Blossman, managing director at Tudor, Pickering, Holt & Co. Securities Inc., at last year's conference.



Details at a Glance

When: Thursday, Sept. 21, 7 a.m. to 5 p.m.

Ethics Hour: Starts at 4 p.m.

Cocktail Reception: 5 p.m. to 7 p.m.

Where: Hyatt Regency Hotel, Imperial Ballroom, 1200 Louisiana St., Houston, Texas 77002

Schedule of Events

"Evaluation Challenges in a Changing World"

Time	Speaker	Affiliation	Topic
7 a.m. – 8 a.m.			Conference Check In and Light Breakfast
8 a.m. – 8:30 a.m.	Don Roesle CEO	Ryder Scott Co. LP	Welcome and Introduction
8:30 a.m. – 9:15 a.m.	John Lee Professor	Texas A&M University	Type Well Profile Analysis - Complexities and Analytic Techniques
9:15 a.m. – 10 a.m.	Vitaliy Charkovskyy Sr. Petroleum Engineer	Ryder Scott Canada	Practical Type Well Profile Construction
10 a.m. – 10:30 a.m.			Break
10:30 a.m. – 11 a.m.	David Porter Principal	Swan Energy Inc.	TRRC Abandoned Well and Plugging Program and Regulatory Problems from Fluctuating O&G Prices
11 a.m. – 11:30 a.m.	Natalie Brown Reservoir Engineering Manager	Forge Energy LLC	Application of Unconventional Thinking to Redevelop a Conventional Reservoir
11:30 a.m. – 12:30 p.m.			Buffet Luncheon
12:30 p.m. – 1:15 p.m.	Bob Thibault Counsel	Haynes and Boone LLP	Financial Security Requirements for P&A, Decommissioning on OCS Leases: 800-Pound Gorilla is Dormant for Now
1:15 p.m. – 2 p.m.	Marc Folladori Senior Counsel	Haynes and Boone LLP	SEC Hot Button Topics, Issues and Comment Letters
2 p.m. – 2:15 p.m.			Break
2:15 p.m. – 3 p.m.	Steve Gardner Sr. Vice President	Ryder Scott Co. LP	Analysis of the Scoop and Stack Plays in Oklahoma
3 p.m. – 3:45 p.m.	Kregg Olson Exec. VP Corp. Reserves Engrg.	Apache Corp.	Alpine High: Overcoming Challenges to Make a Successful Play
3:45 p.m. – 4 p.m.			Break
4 p.m. – 5 p.m.	Jorge Faz Sr. Geological Consultant	Occidental Petroleum Corp.	Ethics of Reserves Evaluations
5 p.m. – 7 p.m.			Cocktail Reception

13th Annual Ryder Scott Conference

Reserves Conference – Cont. from page 2

Despite great promise, the unconventional play comes with challenges on several fronts. To update Apache's progress, **Kregg Olson**, executive vice president corporate reservoir engineering at Apache Corp., will present, "Alpine High Overcoming Challenges to Make a Successful Play."

Scoop and Stack plays

The Scoop and Stack plays in Oklahoma are also attracting attention in the efforts to acquire acreage that is economic at today's oil and gas prices. "Scoop and Stack are among the most profitable plays in the country," said **Steve Gardner**, senior vice president at Ryder Scott, who will present technical and commercial issues on the plays.

Returns advertised by the operators are in the 50- to 100-percent range at \$55-per-barrel oil, with Stack at the higher end. As is the case with many horizontal unconventional plays, completion design is a key driver to well performance and is undergoing continual refinement. "The general trends here are similar to other plays around the US — larger fracs and longer laterals," said Gardner.

What's old is new: Andrews County, Texas

There are other targets besides unconventional. Contrarians are redeveloping lower cost conventional plays by applying advanced horizontal D&C techniques. Their targets are properties with known inventories, minimal drilling obligations and extensive well control that helps assure more technical certainty in estimated future production profiles.

For an example, one needs to look no further than in Andrews County, Texas. In 1929, a major oil find in the county caused a rush there, and by the 1950s, the oil business peaked with discoveries of more than 100 fields.

More than 70 years after its heyday, Andrews County properties, and other fields in the Central basin platform, are being redeveloped with vigor. Led by Forge Energy LLC, privately held independents are dotting the high plains with new horizontal wells.

Natalie Brown, reservoir engineering manager at Forge, will discuss the company's "unconventional thinking" there in developing the San Andres formation with low-risk, horizontal wells offsetting legacy vertical wells.

Know-how and available capital are the yin and yang in the industry. Newer private E&P companies, some with unfamiliar names, are flush with capital and are piloted by savvy owners and managers. In a shifting landscape, those U.S. companies are an emerging force, spending from coffers stuffed with billions of dollars in private capital.

State, federal updates

Regulations, including some that are burdensome or confusing, are a fact of life to be dealt with by the E&P industry. In that spirit, the conference will feature experts discussing recent effects of legislation and what oil and gas companies are doing.

- **David Porter**, a principal at Swan Energy Inc. and a recent Texas Railroad Commission chairman, will discuss the state's abandoned-well-and-plugging program and regulatory problems arising from fluctuating oil and gas prices.
- **Bob Thibault**, an attorney in the energy practice group of Haynes and Boone LLP, will provide an update on the financial security requirements for plugging, abandonment and decommissioning on OCS (outer continental shelf) leases under the Bureau of Ocean Energy Management. "The 800-pound gorilla is dormant for now," he said.
- As in past conferences, **Marc Folladori**, also an attorney at Haynes and Boone, will present hot-button topics, issues and comment letters arising from reserves-disclosure rules of the U.S. Securities and Exchange Commission.

Details

Conference attendees will receive digital versions (PDF files) of the presentations on USB drives, except any withheld by a speaker. These presentations will be posted on the Ryder Scott website at ryderscott.com/presentations. **Larry Connor**, technical coordinator and advising senior vice president, manages the event.

Email requests, questions or comments to RSCConfHouston@ryderscott.com. Attendance is mostly by invitation only. However, a limited number of reservations are available to non-invitees depending on availability of seating.

Ryder Scott will also maintain a wait list of those requesting reservations but who are unable to be admitted because the event is fully booked and registration is closed. Those on the wait list may be admitted in place of those who cancel their reservations or who are no-shows.

Attending licensed petroleum engineers will receive six to eight hours of CEUs (Continuing Education Units). State-licensed engineers are required annually to maintain their licensing through continuing education.

Those who attend the ethics presentation at the reserves conference will receive a one-hour credit, which fulfills the annual requirement of most states for licensed engineers.

High-side forecasts with type wells caused by "survivor bias," says Lee



Good practices guard against inflated EURs

"Considerable anecdotal evidence suggests unintended, optimistic bias in type-well analysis," said **John Lee**, professor at Texas A&M University.

One cause is "survivor bias," where the evaluator drops depleted wells or wells with short histories from the well count while keeping only wells that survive the cut.

"Good practice dictates that the evaluator add the rates of all wells to the economic limit or expected well life on a monthly or regular basis, including zero rates from abandoned wells," said Lee, a member of the National Academy of Engineering

That increases the number of wells used to divide total production resulting in a lower, more reliable average production curve. When the evaluator merges historical production data with production forecasts to build type wells, they represent the best available interpretation of the underlying data.

Auto-forecasting, rapid reviews cut analysis time

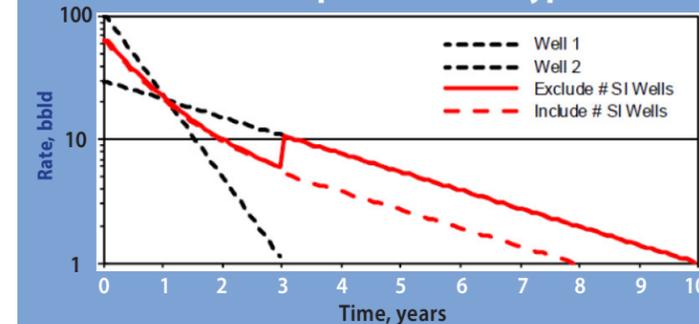
With an "assist," a reserves evaluator can reliably estimate ultimate recoveries from hundreds, sometimes thousands of wells, with little delay through type-well (type-curve) analysis. The assist and efficiency boost come from auto-forecasting.

To conduct type-well analysis more rapidly, evaluators are turning to algorithm-based, auto-forecasting routines featured in production-forecasting software programs. Used properly, they generate best-fit declines and decline models, including the commonly used two-segment Arps.

"Manual forecasting is prohibitively time consuming," said Lee. "However, rapid manual examination can eliminate unreasonable results in auto-forecasts."

Note: Lee said the term "type well" is a more apt than "type curve," because the latter name has already been taken and denotes a different petroleum-engineering process.

Failure to Include Abandoned Wells with Zero Rates Ensures Upward Bias in Type Well



– SPE-162631, see full citation on technical paper at end of article.

Workflow for type well construction and application

In selecting wells for construction of the type well, the evaluator usually needs 200 or more wells with clearly defined trends and minimum noise. Then the wells are placed into distinct "bins," referred to as binning. Each bin should have 50 or more wells to ensure statistical confidence.

The wells are segregated by reservoir fluid type, e.g., dry gas, retrograde gas, volatile oil, black oil. Possible sorting parameters include the following:

- Geological similarity
- Date of first production (vintage)
- Fracture size and fracture fluid type

Please see High-side forecasts on page 6