

Energy companies better able to withstand latest downturn



Ron Harrell, President

The E&P companies with principle assets in North America that survived during the downturn shared certain characteristics. Leadership was typically vested in a core group of motivated, qualified people.

They made objective decisions while refusing to “fall in love” with particular projects. Companies rewarded those hard-working, results-oriented employees with incentive-based compensation calculated from bottom-line revenues, not annual

petroleum-reserves replacement.

Successful producers minimized petroleum reserves writedowns by being careful not to overstate reserves in previous reporting periods. Even though prices were at 20-year lows, when adjusting for inflation, the economics of many E&P projects remained relatively sound.

The estimated future net-revenue streams were still significant, albeit temporarily dampened using an unescalated pricing scenario. Successful explorationists continued to use 3D seismic technology, but they also conducted thorough geological investigations before drilling a “bright spot.”

They continued to use classic techniques—such as log, core and fluid analysis—to help decipher subsurface anomalies on a seismic map. Rather than being overly aggressive with borrowed money, they mainly used cash flow to fund E&P. To minimize overhead costs, companies also outsourced functions, including reservoir engineering and reservoir management. During the downturn, Ryder Scott increasingly served as an outsource for reservoir-evaluation services.

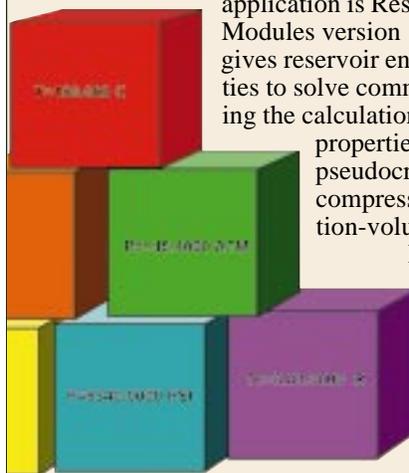
Editor's Note: This article is a slightly revised version of Mr. Harrell's comments that were published in the Houston Business Journal on April 9.

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Basic engineering calculations offered in Modules software

Ryder Scott's newest downloadable Microsoft Excel 97 application is Reservoir Solutions Modules version 1.0. The freeware gives reservoir engineers the capabilities to solve common problems requiring the calculation of oil and gas properties, such as pseudocritical properties, compressibilities and formation-volume factors.



Freeing the engineer from hand calculations, the Reservoir Solutions Modules utility program automatically determines the parameters frequently used in

most in-place hydrocarbon calculations, material balance analyses and other numerical evaluations.

“The primary benefit of these functions to the working engineer is simple, automatic access identical to the Excel 97 built-in functions,” said developer James Latham, a Ryder Scott engineer. “Another primary benefit is Modules software provides flexibility and portability, because it can be used anywhere on any worksheet chosen by the engineer.”

“Reservoir Solutions Modules software gives engineers the capabilities to calculate oil and gas properties.”

The functions can be incorporated into templates that engineers or geologists create for volumetric calculations or other repetitive tasks. Programmers may also “call” the calculations for use with their own Visual Basic programming. “In a layperson's language, an in-house Visual Basic program can go outside and ‘grab’ the Modules functions and then use them internally,” said Latham.

Included in the program are functions for calculating T_c (pseudocritical temperature), P_c (pseudocritical pressure), Z factor (real gas deviation), shut-in bottomhole

Please see Modules on next page

Modules—Cont. from Page 1

pressure, C_g (gas isothermal compressibility), C_w (water isothermal compressibility), C_o (oil isothermal compressibility), B_o (oil formation volume factor) and B_g (gas formation volume factor) — all of which are based on widely accepted algorithms and industry standard practices that have been enhanced by Ryder Scott for ease of use and accuracy.

“Overall, these functions provide the technical professional or student the means to efficiently solve many time consuming tasks. Stay tuned for updates in the future,” said Latham.

The freeware is accessible for downloading in the Download section of the Ryder Scott website at www.ryderscott.com. The site section contains instructions for installation as well as the submission form that must be filled out and electronically sent back over the Internet to Ryder Scott. The firm will then e-mail a password to the user that enables the Modules program.

This latest program is the fourth in a continuing series of periodic releases available to the industry over the Internet. (See article, *Ryder Scott software is a hit*

with users worldwide, on the next page.)

Ryder Scott professionals use Modules and the other available freeware programs internally. However, these downloadable programs are not designed to be substitutes for the more sophisticated suite of evaluation tools required by

and used by Ryder Scott for complete in-depth analyses.

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

Coming in September

Deepwater Reserves Booking Practices Survey—Recently, Ryder Scott surveyed deepwater Gulf of Mexico operators to find out what methods they use to initially book proved reserves for U.S. SEC reporting purposes. Only respondents will receive the full survey results, but *Reservoir Solutions* will publish a summary of the findings, which should clear up some questions about the industry “norm” for booking practices in the GOM deep water.

Coalbed Methane—While the rest of the world is beginning to realize the promise of large coalbed methane deposits, E&P companies in the U.S. have taken advantage of economic incentives and new extraction technology for years. Now the U.S. CBM industry is peaking. Ryder Scott has performed reservoir studies in all major producing basins in the U.S. as well as elsewhere internationally.

Seeing is believing—A familiar and often reliable adage. But, if spoken while looking at seismic data, another old saying should come to mind—skepticism is the first step toward truth. Seismic reflection data, especially from high-resolution 3D surveys, help define a majority of the oil and gas reservoirs studied by Ryder Scott. The information contained in a seismic data volume commonly allows mapping and booking of reserves beyond what is proven by wells alone. However, using this information always requires consideration of the many factors that can conceal, exaggerate or distort the geology of a reservoir.

Publisher's Statement

Reservoir Solutions newsletter is published quarterly by Ryder Scott Company Petroleum Engineers. Established in 1937, the reservoir evaluation consulting firm performs more than 1,000 consulting 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 115 employees, including 64 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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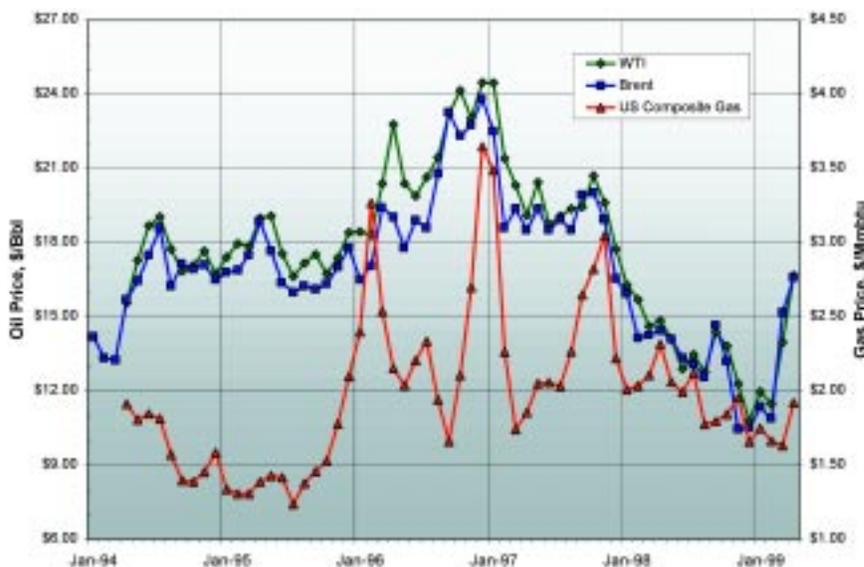
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Benchmark oil and U.S. composite gas price history



The West Texas Intermediate Crude (WTI) prices are the posted prices of Exxon Co. USA published in the *Crude Oil Price Bulletin Summary*. Composite spot gas prices are the wellhead prices published in the *Natural Gas Week* newsletter. Brent oil prices are the published, posted prices available to the general public from commodity quotation services over the Internet.



Countries where Ryder Scott software is used

Ryder Scott software is a hit with users worldwide

Freeware proliferates in 19 countries as downloaders share programs with others in the industry

More than 200 technical and financial personnel around the world have downloaded the free Excel applications developed by Ryder Scott. "Many of those users have shared the programs with colleagues. We don't know exactly how many copies are currently in use, but it is quite a few more than 200," said James Latham, the Ryder Scott engineer who developed the programs.

The firm offered the first program last September. The material balance application for gas, gas-pressure analysis program, QuickLook economics evaluation application and Reservoir Solutions Modules utilities program are available for downloading from the Ryder Scott web site at www.ryderscott.com.

Here are a few responses from users:

- "I use the flowing bottomhole pressure feature, because we don't take many true bottomhole pressure surveys in the shallow Antrim play. All we get is surface data. I use QuickLook to see if I should do a full-blown economic analysis for corporate review."—William K. Morrison, CMS Energy Oil & Gas Co.
- "I use the P/Z calculation for reserves estimates, production-performance monitoring, drilling, workover and compression recommendations. I

use the material-balance program frequently and find it to be a useful analytical tool."—Barry Langham, Chesapeake Operating Inc.

- "I use the absolute open flow feature. The gas well analysis program is quick and simple to use."—Lorne Schoenthaler, Gulf Canada Resources Ltd.
- "I use three programs. QuickLook is a great quick-screening tool for nonstructured people who may not be 'power users.' The program is great for credibility, a standard way of showing engineering results and much better than (another economic evaluation program) I previously used."—Glenn Sliva, petroleum engineer, Lone Cypress Engineering Inc.
- "I've been using the material balance program the most. It is great for a geologist doing 'scoping' work before getting the 'real' reservoir engineers involved."

"I am a user of (other commercial applications) and feel the ones Ryder Scott has written are better and/or complement the other programs."—Bruce Archinal, vice president, Pogo Producing Co.

- "The material balance program works very well. I've been using it for work on some gas fields in south Texas. I like the ease of use for raw data entry. Comparatively, I have been using an

older, commercial Excel spreadsheet application that is not pretty, but gets the job done."

"The Ryder Scott program is a little easier to use and the graph and calculated results are a bit more pleasing too. In the spirit of shared technology within the petroleum engineering profession, I applaud those people within Ryder Scott for their effort. Great job!"—Richard Starkey, Coda Energy

- "Currently, I use the P/Z analysis program. It's excellent, the graphics present exactly what is needed and the data inputs are very user friendly. I'm very pleased with the program and will check in periodically to see if any new programs are out there."

"I used your program in one situation on an offshore reservoir. The P/Z program took only five minutes to setup. It's been very beneficial to the company and me."—Ed Skrljac, petroleum engineer, Dominion Energy Inc.

- "I have been using the P/Z software to estimate reserves in one of the largest gas fields in the north of Mexico. An initial problem was that we had a Spanish version of Excel, but James Latham from Ryder Scott solved the problem very quickly."—Javier Guzmán, Pemex in Reynosa, Tamaulipas.

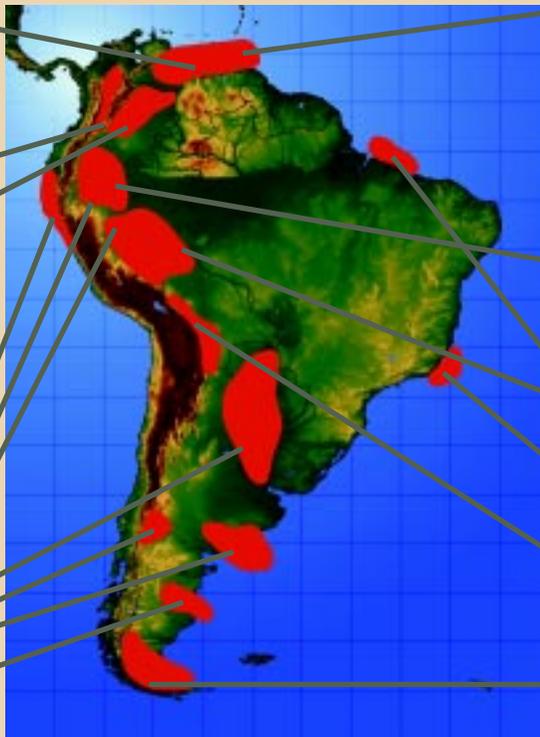
Areas of South America Evaluated by Ryder Scott

Venezuela properties include some of those offered in the Second and Third Operating Agreement rounds and many other oil and gas fields.

Colombia properties include the Cusiana and Cupiagua fields, Guaduas field, Las Monas area, Middle Magdalena Valley, Rubiales field and the Purificacion, Revancha and Venganza fields.

Peru properties include the Block 16-A concession and the offshore Talara production area.

Argentina properties include many major oil and gas fields in the Neuquen, Austral, San Jorge and Northwest basins in both on- and offshore areas.



Trinidad and Tobago properties include several major offshore gas fields.

Ecuador properties include the following major fields in the Oriente Basin: Coca, Fanny, Amo, Payamino, Mariann, Capiron, Jaguar, Tarapoa, Tivacuno, Oso, Iro, Bogi and Daimi. Also included is the Pacoa field.

Brazil properties include areas in the Campos and Acre basins and off the northeast coast.

Bolivia properties include those in the Chaco area.

Chile properties include areas in the Magallanes Basin.

Apco Argentina uses Ryder Scott as technical arm for acquisition evaluation

Apco Argentina Inc. engages Ryder Scott not only to perform annual reserves estimates of its principal property in Argentina, but also to evaluate prospective acquisitions on an as-needed basis. "Evaluations of acquisitions are done sporadically, so we don't need full-time staff members for that. We do, however, use Ryder Scott on a project basis to complement our internal staff," said Thomas Bueno, general manager at Apco Argentina.

Ryder Scott also acts in that capacity for Williams Cos. Inc., which owns 69 percent of Apco Argentina. Williams International commissioned Ryder Scott in 1997 to conduct a property evaluation of the La Concepcion area offered in Venezuela's Third Round. In that appraisal, Ryder Scott evaluated the potential of La Concepcion and analyzed the performance of existing wells. Ultimately, Williams took an interest in the area under a 20-year operating agreement as a partner with operator Perez Companac of Argentina.

Williams also commissioned Ryder Scott to evaluate the Dacion properties in east Venezuela in a Third Round offering. Last year, Ryder Scott evaluated properties in Venezuela, India and Canada for Apco Argentina for its consideration of a possible merger. The evaluation included data-room work and a review of seismic and economic data from Venezuela.

"Our familiarity with the production-sharing contracts allowed us to efficiently run several economic sensitivities for the Venezuela and India properties," said Herman Acuña, the Ryder Scott engineer in charge.

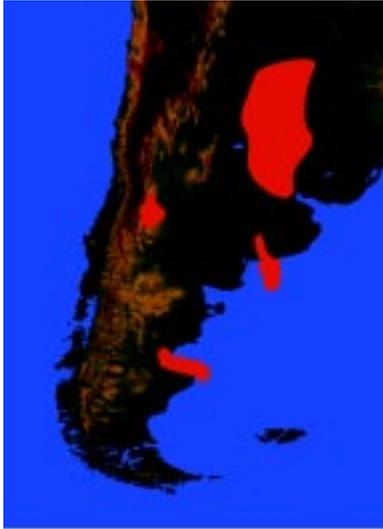
"Ryder Scott has a good reputation in the energy industry." — Tom Bueno

Also, on behalf of Apco Argentina and Williams, Ryder Scott evaluated properties offered by Premier Oil plc in Malaysia, Thailand, Burma and Pakistan during the "Asian economic crisis." Acuña said, "Given the economic situation in the Asia-Pacific region, it was important to understand both the technical and marketing exposure of the different projects." He performed a risk-evaluation of the properties and a marketability analysis for the gas in Pakistan, Thailand and Burma.

Ryder Scott's goal is to carefully analyze all pertinent data and furnish a reliable property appraisal. Such clients as Apco Argentina and Williams reduce the risks associated with multi-million-dollar acquisitions by commissioning a reliable, independent consultant to review field data.

"We chose Ryder Scott to evaluate these prospects, because the firm has a good reputation in the energy industry and with bankers. We also know the Ryder Scott personnel through years of working together and feel comfortable with them," said Bueno.

Ryder Scott's major work in Argentina began in the 1960s



Ryder Scott's major consulting work in Argentina began shortly before the reopening of the country's petroleum industry in the 1960s and continues to this day.

The firm was one of a small vanguard of outside service companies operating in Argentina shortly before the country relaxed restrictions and reopened its oil and gas fields to foreign interests in 1967.

Ryder Scott has performed numerous studies in the (top to bottom) Chaco, Neuquen, Colorado and San Jorge basins.

In 1966, Ryder Scott contracted with YPF to prepare economic and engineering reports, purchase development equipment and supervise installation. The agreement also called for the firm to supervise waterflood operations in the Barrancas Sur field in Mendoza and Canadon Leon field in Santa Cruz.

In 1968, a year after the new oil law went into effect, Ryder Scott entered into a 10-year agreement with Bidas Sapic and Home Stake Production Co. of Tulsa, Oklahoma, to supervise production and waterflood operations in two Neuquen basin fields, the El Sauce and Cerro Bandera. From 1964 to 1969, John F. Buckwalter, a partner in Ryder Scott, made 13 trips to Argentina.

"Without a doubt, Argentina has made a vast change for the better during the past few years," he wrote in reference to the liberalization.

During the mid to late '60s, Ryder Scott was involved in



Earl Douthit, a field technician with Servicios Ryder Scott S.A., inspects a pump at a water-injection plant in the Barrancas Sur field in the Mendoza area of Argentina circa the late 1960s. The firm contracted with YPF to supervise waterflood operations.



Ryder Scott's current evaluation team for Argentina comprises (from left) Tina Obut, Ron Rhodes, George Dames, Gualo Ramirez, Tom Gardner, Jim Broome and Herman Acuña. In 1998, the Ryder Scott team, under the direction of Ramirez, evaluated properties in Argentina for six clients

"Without a doubt, Argentina has made a vast change for the better during the past few years." — John F. Buckwalter, referring to the period after the reopening of oil and gas fields in Argentina in 1967.

six waterflood oil fields. The Servicios Ryder Scott S.A. subsidiary was formed and offices were maintained in the city of Neuquen and in the town of Cutral-Co in Argentina.

Ryder Scott spun off its subsidiary in 1972. However, the firm continued its work in Argentina, which consisted mainly of field evaluations.

Ryder Scott has recently evaluated major oil fields in two onshore basins, Neuquen in southwest Argentina and Golfo San Jorge in the southeast. Other work includes analysis of oil-producing formations in the Noroeste, Cuyana and Austral basins.

Ryder Scott has also estimated the reserves and performed special field studies of major gas fields in the Neuquen basin. Other gas-property appraisals have focused on areas in the on- and offshore sectors of the Austral basin as well two major gas deliverability studies.

Ryder Scott evaluations of properties in Argentina during the last seven years are quantifiable through 2,500 internal records, each unique in that it contains a mutually exclusive field, well, zone, report date, client or client purpose. 1998 was the busiest year yet as more than 1,000 records show that Ryder Scott performed evaluations for six clients with interests in numerous fields in Argentina.

Gualo Ramirez, senior vice president – international, heads up Ryder Scott projects in Argentina. His team comprises engineers Herman Acuña, Tom Gardner, Tina Obut and Ron Rhodes and geologists Jim Broome and George Dames.

Since 1981, on behalf of Ryder Scott clients, Ramirez has either evaluated or supervised appraisals of properties in all major basins of that region.

For further information on evaluation services in Argentina, contact Ramirez at 713-651-9191, ext. 210, or send an e-mail to Gualo_Ramirez@RyderScott.com.

Acuña presents methods for quantifying loss-of-bargain damages at the 1999 SPE HEES in Dallas

International operators, corporate attorneys and consulting engineers who serve as expert witnesses now have a standard reference for calculating sought-after damages resulting from breaches of contract in international agreements. Ryder Scott engineer Herman Acuña presented such a paper at the 1999 Society of Petroleum Engineers Hydrocarbon Economics and Evaluation Symposium (HEES) in March. He wrote the paper with assistance from fellow consultant Forrest A. Garb.

“Quantification of Economic Damages Resulting from a Breach of Joint Venture or Joint Operating Agreement” (SPE paper number 52961) is the first paper published by SPE that discusses the Loss of Bargain (LOB) approach for calculating damages. Whenever a host country reneges on a petroleum contract or nationalizes privately operated properties, the aggrieved parties seek compensation for damages in arbitration and court cases. Usually, the amount of compensation is hotly contested, with both sides supporting their cases with different approaches.

The host country, in the past, typically argued that the amount of the compensation should be based on the book value of the petroleum property. This valuation method provides for only the bare physical assets at the time they were purchased. However, the Iran-United States Tribunal has stated that the assets of investors should be valued as a going concern, taking into account not only the net book value of assets but also such elements as good will and likely future profits.

So based on that precedent, governments have agreed to monetary

“The LOB calculation recognizes all profit, even that which is normally transferred to a buyer, as part of the benefits denied to the victim.”



Herman Acuña

“The FMV approach can seriously underestimate the damage calculations in an LOB... even using the same technical assumptions.”

damages tied to the fair-market value (FMV) of the seized properties. That approach attempts to make the investor whole by having the breaching party pay what it would have paid in an open-market transaction.

However, Acuña contends that the FMV approach does not go far enough. He believes that the FMV approach is not appropriate because it involves an amicable agreement between a seller and buyer and as such, FMV calculations inherently transfer potential profit from the asset to the buyer.

“This has to be true or else a willing transaction would not occur. Property acquisitions are profit driven,” said Acuña. On the other hand, in a LOB approach, the buyer is denied any “profits” normally associated with purchase of a property bought at market

price. Instead, the LOB calculation recognizes all profit, even that which is normally transferred to a buyer, as part of the benefits denied to the victim.

For that reason, future net revenues under the LOB approach are discounted at lower rates than those derived from the FMV method and as such, the calculation of damages is higher. “The FMV approach can seriously underestimate the damage calculations in an LOB even when both evaluations are conducted using the same technical assumptions,” said Acuña. The technical considerations might involve the estimation of hydrocarbon volumes and future production.

He advocates discounting a properly risked future net revenue at the cost of money to account for the time value of money. That discount factor might be interest rates commonly charged in the cost-recovery mechanisms of the Joint-Venture Agreement (JVA), Joint Operating Agreement (JOA) and Production-Sharing Agreement (PSA). The cost of debt incurred to finance the project might also be another discount factor.

Another distinction between LOB and FMV is that a LOB calculation does not include deductions for risk factors under the control of the breaching party or for those risks mitigated by the agreement. For instance, in a LOB approach, when the government breaks the contract, future revenues are not discounted by host-government uncertainty. “Deductions for host-government risk financially benefit the offending party,” said Acuña.

In the paper, he cites sample calculations and two case studies. Comparing the cases results in an FMV calculation only 26 percent as high as the LOB quantification, even though both evaluations assumed the same risked reserve base and reservoir producibility.

The HEES, held in Dallas, brought together technical and financial members of the industry involved in petroleum evaluation and economics.

Editor’s Note: The opinions expressed in Mr. Acuña’s paper and this article are not necessarily those of Ryder Scott Company Petroleum Engineers.

Thompson recalls thrills of bareback riding



Andy Thompson rides Little Joe in the Super Summer Rodeo at Invermere, British Columbia, in 1983. Smaller and lighter than the average bucking horse, Little Joe leaps vertically while Thompson leans back anticipating the shock of landing.

Rodeo bareback rider Andy Thompson slowly made his way to the bucking chute on crutches, intent on taking another wild ride. A week before, a 1,000-pound bronco trampled Thompson after he was bucked off and his hand stuck in the riding grip. Still hobbled, he needed help from a traveling buddy.

Seconds before the markout (start of the horse and rider out of the chute), Thompson tried to get his swollen hand through the made-to-fit handhold, but it wouldn't squeeze through. So his partner used a pair of pliers to clamp down on the fingertips of Thompson's glove and pull his puffy hand through.

"Since I wasn't able to close my hand, I lasted only a few jumps outside the chute," Thompson said. "Those were my stupid kid days."

When the Calgary Stampede rodeo kicks off in early July, Thompson will be there like the rest of the crowd. But he'll have more appreciation of the roughstock events than the average fan, because Thompson rode bareback from the early to mid 1980s. He traveled around Alberta, British Columbia, Saskatchewan and the northern United States, entering several rodeos, sometimes three in one weekend, including novice bareback riding at the Calgary Stampede.

Thompson, now a member of the Ryder Scott Calgary engineering staff, almost turned professional, but thought better of it after considering the slim money-making prospects.

Rodeoing comes naturally to Albertans in rural hamlets. These hotbeds

of talent produce sons and daughters who become national champion cowboys and cowgirls. So it's not surprising that Thompson as a youngster near Manyberries, Alberta, a hometown of rodeo champs, dreamed of riding into glory on the back of a bucking horse.

One of Thompson's grade-school pals was Brian Haraga, whose father was Arnold Haraga, a Calgary Stampede All-Around Champion. When they were 18-years old, Haraga convinced Thompson at the last minute to enter the local bull-riding and bareback riding events.

Lacking the right equipment, Thompson had to improvise. As luck would have it, he drew a large bull and was barely able to tie Brian's steer-riding rope around the bull's girth. "I didn't last long on the bull," Thompson said.

The elder Haraga let Thompson use his old rigging for a bareback ride and helped cinch it to the horse. (The rigging has a handhold, similar to a suitcase-handle. A cinch with latigos is strapped to the rigging, holding it in place while encircling the girth of the horse.)

As Haraga tightened the cinch, a latigo broke, so he tied the cinch in a knot for Thompson, who was running out of time before the markout. "The knot held, but I was thrown off hard," he said.

Afterwards, Thompson bought good equipment, joined the Chinook Cowboys and Foothills Cowboys associations and practiced riding at a facility in Olds, Alberta. Getting hurt is just part of the sport, the riders say.

"My mom wasn't too impressed with

my rodeo activities. She didn't want me to do it, because of the danger, but my friends were all doing it," said Thompson.

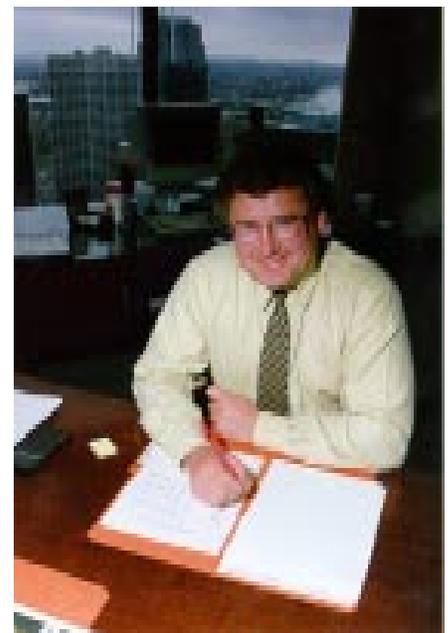
A bull once kicked Thompson in the leg as he was trying to get away, but his closest brush with danger came when he got "hung up" riding bareback at a rodeo at Leduc, Alberta. He was thrown off a bucking horse and his hand stuck in the grip while the rigging slipped under the horse's front leg.

The spooked bronco dragged the husky Thompson around the arena like a rag doll for two laps, kicking and stomping his legs while the "pick-up" men unsuccessfully tried to slow up the horse enough to loosen the rigging and free him. Finally, the horse stepped down so hard on Thompson that his hand, by now bound even tighter, popped free.

"All the muscles in my legs were torn up and I was on crutches for four or five weeks," Thompson said. "The wrecks never discouraged me from riding because of the terrific feeling I got from making a good ride and placing."

In 1989, Thompson received a B.S. degree in petroleum engineering at New Mexico Institute of Technology. "Since it took longer to heal between rodeos, I quit riding to concentrate on my studies," he said. And his mother was quite happy. 🍁

Editor's Note: Andy now makes informed, reasoned decisions for clients — not the type he made as a youngster.



Andy Thompson at his Ryder Scott Calgary office this year.



Seven Seas' innovative data acquisition reduces uncertainty about reserves of atypical Guaduas field

Seven Seas Petroleum Inc.'s innovative data acquisition in the atypical Guaduas field in Colombia has reduced uncertainty and recently enabled Ryder Scott to assign greater proved reserves to the low-porosity, naturally fractured reservoir. "Nontraditional reservoirs require nontraditional evaluation techniques and data-acquisition methods to ensure that none of the proved reserves are overlooked," said Tom Gardner, Ryder Scott engineer in charge of the evaluation.

Seven Seas incorporated an alternative porosity measurement using a core-weighting technique. The measurement increased confidence in the porosity data, lowered the water saturation values and ultimately enabled Ryder Scott to categorize more reserves into the proved category. "We used the weight-volume technique to determine whole core porosity in samples that contained multiple fractures, but were too fractured for conventional analysis," said Russ Cunningham, Seven Seas exploration manager. He explained that highly fractured rock is difficult to obtain through conventional core acquisition because the core barrel jams in the rubble zones.

The magnitude of porosity in the Guaduas field is close to the magnitude of error of the logging tools normally used to measure porosity. This dictated the need for using special techniques for core- and log-data acquisition and evaluation.

"The porosity tool is accurate within plus or minus two porosity units. If the porosity value is 2 to 4 percent, then the inherent tool error is 50 to 100 percent of the insitu value," said Cunningham. Hole rugosity, bed resolution, tool calibration and rock matrix density variations in the Guaduas

field would have also caused errors in conventionally acquired log-derived porosity values.

Also, Seven Seas carried out well-designed pressure interference testing on four wells that showed they are in communication and the fracture sets are in communication in all directions, including in the dip direction perpendicular to the major fracture orientation. "Given the high permeability, this is important because it proves that primary production recoveries can be greatly enhanced by gravity segregation and gravity drainage," said Gardner.

Over a three-year exploration period, Seven Seas conducted 2,600 hours of production testing and 720 hours of pressure buildup testing on five wells. "The pressure and geological data indicated the flow mechanism is from a dual-porosity fracture system," said Chuck O'Brien, Seven Seas reservoir engineering manager.

Ryder Scott modeled the production with terms of the agreements under the two association contracts, the Dindal and Rio Seco. The firm ran various producing scenarios including gas injection alone and a combination of gas and water injection.

Then Ryder Scott calculated the cash flows. The integration of the reservoir engineering with the various economic terms of each concession agreement added value to Seven Seas operations. "Ryder Scott's work allowed for a net present value assessment of upside in the discovery," said O'Brien. "Tom (Gardner) has been very responsive to critical time schedules and his experience and knowledge with U.S. Securities and Exchange regulations have been very helpful to this company."



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