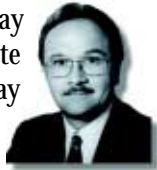


## SERVICES COMPLEMENT SOFTWARE

Some of our clients may only know of Fekete by our software and may have only talked to Ed Ferguson. In fact, if you talk to Ed, you may not get a chance to talk! Not to worry, there are a lot more "Feketies" and we don't all SHOUT into the phone.



Ed Ferguson

PoolSim™ to the wellbore (F.A.S.T. VirtuWell™) to the pipeline (F.A.S.T. Piper™) to the bottom-line (F.A.S.T. CashPot™).

Given the current uncertainty of the world oil market, the immediate necessity of most producing companies is to optimize existing production. Why spend money to drill more wells if what

### YOU'VE SEEN OUR SOFTWARE, NOW TRY OUR SERVICE

This leads us to the theme of this newsletter "You've Seen Our Software, Now Try Our Service". Behind each of Fekete's software programs is a group of technical experts who use the software on a daily basis to address our clients' most pressing problems.

The Fekete toolkit of software allows integrated analysis of each step of the flow process from the pore-throat (F.A.S.T. WellTest™ and F.A.S.T.

you already have is not working at its maximum potential? This is where our staff put F.A.S.T. VirtuWell™ to work.

Secondly, if drilling is necessary to capture new reserves, then an evaluation of the risk/reward profile calls for the use of F.A.S.T. CashPot™.

On the following pages, we'll present the services behind the software through a series of case studies. If Fekete can help your company optimize its assets, please call any of our staff through our main phone number (403) 213-4200.

### Fekete Australia awarded Santos IRS Contract

In its largest project to date, Fekete Australia has commenced work on an Integrated Reservoir Services (IRS) contract for the South Australian Business Unit of Santos. The contract was awarded to the Fekete/Landmark/Halliburton Consortium in early December and approximately 15 people have been deployed to Adelaide for up to 2 years. The project mandate is to prepare a development and depletion strategy for 350 wells in 9 fields which requires integration of geological, geophysical, geostatistical, reservoir, production and facilities engineering into a comprehensive reservoir simulation model. Interpretation Team Leader, Karl Meade says "this is an excellent opportunity to work in concert with Santos staff in order to maximize their asset base".

For details on all our software products and engineering services (and for FREE software), visit our *updated* homepage at <http://www.fekete.com>

Thank  
You

*Our thanks to all clients for the positive feedback on the newsletters. We will continue to make future editions technical, topical and just a little bit fun.*

*We would also like to thank all SPE members who selected F.A.S.T. WellTest™ as the most highly recognized advertisement in the engineering software/services category of the Sept/98 JPT. (We received a great plaque for our reception area!)*

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#### OUR NEXT ISSUE

*Surprise!*

# Tech Talk: What's Coming Down the Pipe?

Ralph McNeil is Fekete's Manager of Gas Deliverability Projects and is the driving force behind F.A.S.T. Piper™. In the following article, Ralph discusses how his group uses F.A.S.T. Piper™ to solve a wide range of problems in projects conducted for Fekete clients. The project experience has fuelled development of new features to be included in the 32-bit software version (due for release in the third quarter of 1999).

In theory, generation of accurate gas production forecasts can seem tantalizingly easy. Indeed, a complete single-well model can be resolved using a calculator or spreadsheet. The trouble arises when we try to expand this model to multiple wells, multiple pools, multiple interconnected pipeline segments and multiple compressors. The solution becomes extremely non-linear and iterative because of the complex interactions between various components of the system.

How do we deal with these complications?

Material Balance

Storage

LIT Analysis

Production History Plotting

Auto-tune to Production History

32 bit calculation rate

Cut and paste

Database Export

Well location by lat/long

On-screen Drawing

The seemingly obvious answer is to put all the data into a simulation model and see what happens. Sometimes the resulting model matches current field measurements - but not very often. This is the point in a modeling project where we can begin to answer questions or we can lose focus and head off into what I call, "modeling space". If we recognize that the model does not match current operating conditions because the pipeline data is not correct, or the pressure measurement data is not reliable, or the pressure measurement points were not comprehensive, then we will be able to ask the right questions. Once we ask the right questions, we'll get data that makes sense and be able to replicate current conditions in order to do a proper diagnosis of the system status. If we just accept all data without question and think that a model match can be achieved using a more complicated model, then we will end up with a very complicated model that may or may not replicate current conditions and will almost certainly make a proper system diagnosis impossible. The latter is what I call "modeling space".

How do we ensure that our model will be only as complicated as required and will be a reliable forecasting tool? First, we must clearly define our objectives and stay focused on answering only those questions that are relevant. An all-encompassing model that everyone can use is a nice idea but will almost always create a very complicated model that no one can use successfully. Second, we

must break the modeling down into manageable components. The process we have developed starts by matching the calculated pipeline pressure losses to the measured pressure losses, followed by modeling deliverability (which includes, in part, the reserves), followed by modeling the compressors and finally the wellbores, if required. By focussing on small pieces we can clearly demonstrate that each component was successfully modeled. The completed components are then assembled into a final model that will replicate the component performance, replicate current conditions and more importantly accurately forecast future scenarios. This approach is very practical and, if followed systematically, will yield a completely integrated and non-linear model in which each of the individual segments responds predictably.

So, what is coming down the pipe? Development of the 32-bit version of F.A.S.T. Piper™ is well underway. We have taken this opportunity to do a complete rebuild in order to incorporate new features. Look for even better input editors with spreadsheet style cut and paste; powerful on-screen drawing tools (enter well coordinates and then draw in pipelines); production history import from third-party data providers; export of results to a database, and greatly enhanced calculation speed.

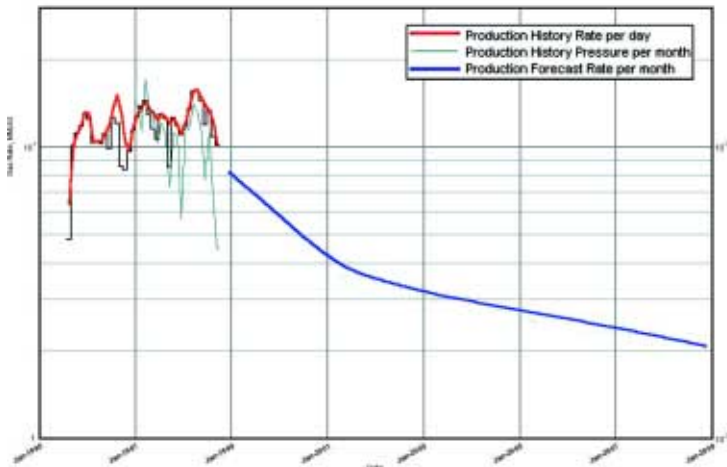
The proven and practical logic of segmentational tuning will be more fully integrated into the software such that pipeline tuning will only require data relevant to pipelines (no reservoir stuff), deliverability modeling will require only deliverability data and so on. New technical features will include easier setup of flow loops, line loops, multiple plants and multiple off-takes, addition of storage wells and storage pools, addition of L.I.T.

analysis parameters for deliverability, more flexibility for compressor capacity curves input, and many other enhancements. In subsequent releases we are planning to include the "communicating reser-

voir" concept in which "tight" gas is modeled as multiple tanks which are in partial communication (the user specifies a transmissivity between the tanks). Another new feature will be a history-matching capability over a period of time to ensure an even greater degree of confidence in the model. The user will be able to import production and flowing pressure data and tune the pipeline pressure losses, analyze deliverability and possibly even estimate the initial gas-in-place as per the Flowing Gas Material Balance (see "www.fekete.com" for a technical paper on this topic). The model production forecast can then be viewed with the historical data enabling the user to immediately see the validity of the forecast as well as forecast rate changes and remaining reserves, while



# Tech Talk: More Services



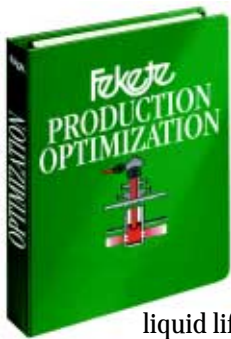
F.A.S.T. Piper™ plot showing production history and forecast. Change in slope of forecast reflects shut-in of nearby well in same pool.

incorporating real-life changes such as additional compression, which is not possible with conventional decline analysis.

As an integrated petroleum consulting company, our vision is to ultimately develop F.A.S.T. Piper™ into a gas production analytical simulator - from the pore throat to the plant. As practical engineers, we will continue to develop solutions that both simplify the problem and generate accurate results.



Ralph McNeil is a Senior Reservoir Engineer with Fekete Associates Inc. with over 18 years of petroleum experience. His career has focussed on gas deliverability modeling for the past 8 years and he has been teaching courses internationally for the past 5 years.

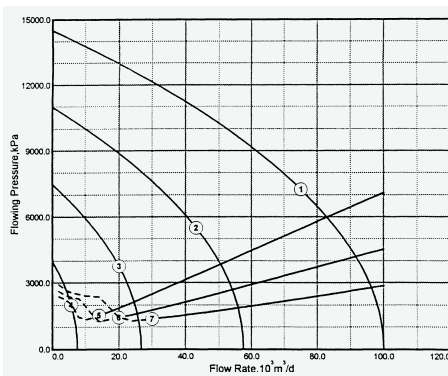


A new piece of software that has also been used for in-house projects and will be released later in 1999 is F.A.S.T. VirtuWell™. The program performs detailed flow regime, pressure drop and liquid lift calculations on both

vertical and horizontal wells. The result is a key piece of software used by our Production Optimization Group in conducting tubing performance and stripper compressor evaluations.

A recent study required optimization of the initial completion design for new horizontal gas wells located in the deep basin area of Alberta. Compositional analysis showed high condensate yield and the potential for serious slugging problems. Based on client input, a variety of reservoir and surface conditions were analyzed to create a "bible" of IPR and tubing performance graphs that are applicable for any combination of conditions that new wells would encounter. The graphs identify the expected flow rates and wellbore pressure drops and the minimum flow rate required to maintain stable production.

The "bible" has proven useful in demonstrating that only a couple of completion configurations are required to handle the wide variety of conditions that could be encountered. Completion personnel use the graphs to quickly select



**Multiple tubing performance curves (5,6,7) are overlaid on reservoir IPR curves that decline as the well is produced (1,2,3,4). Dashed lines represent unstable flow conditions.**

the optimal tubing design based on cleanup results. The book can also be used to identify when reservoir depletion and gathering line pressure will combine to hamper well productivity. This feature allows the operator to proactively plan future workovers and gathering system upgrades and, ultimately, to maximize the return on capital.



Sarah Williams is an engineer with our Production Optimization Group.

## Upcoming Courses

A three-day (intermediate level) Pressure Transient Analysis course is being taught in Midland, Texas for the Society of Petroleum Engineers (Permian Basin Section) by Fekete's President, Louis Mattar M.Sc., P. Eng. The course runs May 11 to 13, 1999. To register please contact Ed Pittinger at 915-688-0607.

While in Midland, Texas, Louis will also be presenting a luncheon lecture on Pressure Transient Analysis for the Society of Petroleum Engineers (Permian Basin Section) on May 12, 1999. Please call 915-686-7329 or e-mail at [rsvp@spe-pb.org](mailto:rsvp@spe-pb.org) if you are interested in attending.

In Calgary, Louis will be teaching his annual CIM course in Gas Well Test Interpretation from May 17-21, 1999. To register, please contact Vera White at the CIM office at 750-5457.

Fekete offers courses on a regular basis. If you want to place your name on the list for the next available course, please contact Jennifer Day in Calgary at (403) 213-4200.

# INTRODUCING - WELL TESTING SERVICES GROUP

We're replacing our usual back page "News and Notes" with a new segment entitled "Introducing . . . .!" In future newsletters we'll present the Reservoir Evaluation, Production Optimization and Programming groups, but first, we're pleased to highlight the eleven members of our Well Testing Group. If you have seen our reports, here's the chance to put a face to the names.

Everybody knows our president, and well test guru, **Louis Mattar**. What is not as well known is that Fekete's other well testers are constantly challenging Louis with technical interpretations. Among them is **Marty Santo**, manager and quarterback of the group. "Meticulous Marty" is renowned for looking at every detail of a test. He is just as meticulous with his fishing equipment (heated truck, heated camper, heated boat, heated arguments....).

Working with Marty are the other team members pictured to the right. **Steve Andrews** stands head and shoulders above the rest of the group (literally!). With his extensive field experience, Steve has been a great addition to the group.

The Fekete ball team has also benefited from his home-run prowess. Normally the guy on base in front of Steve is **Reza Ali**. Baseball keeps him in shape for chasing the ladies. The stories from his recent trip to Mexico only confirm what we already thought (he'll be insufferable now!). **Tim Dreger** is the first baseman and team manager. When he's not eyeing the sports stats, he's looking at 70,000 data points from an offshore test. Another guy who has improved his stats this last year is **Trevor Thompson**. It's amazing what laser eye surgery will do.

If **Charity Engelking** isn't in the office, she is probably out riding one of her two horses. Charity joined Fekete after working

for a testing company and she is therefore responsible for providing client support for our F.A.S.T. FieldNotes™ software. F.A.S.T. isn't only applicable to our software, it describes the 1970's muscle cars that **Keane Dauncey** restores (ask him about his 1970 Chevelle Malibu). A classmate of Keane's was **Corey Brennan**. After being with Fekete for a couple of years, Corey has been accepted into the Alberta College of Art – quite an accomplishment. Corey was responsible for designing the Piper logo on our golf shirts last year. He'll continue to work for Fekete on a part-time basis and will handle the AOF and PAS requirements for the EUB. Another student is **Amy Dunfield** who is on her intern assignment from the University of Calgary. That ex-professor Louis hasn't lost his ability to terrorize students – just ask Amy! Last, but certainly not least, is the newest group member, **Colin Jordan**. Next time you're at the Glenbow Museum, you might find Colin volunteering and giving tours.



**From back left: Steve Andrews, Corey Brennan, Tim Dreger, Marty Santo and Keane Dauncey. Front left: Reza Ali, Amy Dunfield, Louis Mattar, Charity Engelking, Trevor Thompson and Colin Jordan.**

We are proud of the achievements of all members of our Well Testing Group. Between them, they have over 100 years of industry experience covering every conceivable aspect of well testing. The next time you receive a report, please don't hesitate to give the analyst a call and discuss the test in more detail.

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