President's Remarks

On behalf of the CWLS, I would like to welcome you to our inaugural newsletter. We are quite proud of our achievements over the past year. Following our 40th anniversary celebration last fall, we published a special edition Journal which sold out. A very successful AGM in February with Ron McLean, and a joint workshop in April with the CSPG have kept us busy. Now, the CWLS has embarked on a new service that we feel will benefit all our members, the quarterly newsletter.

The idea for the newsletter came about one day over coffee when Jane McTaggart suggested that the membership needed more than just the Journal to keep them informed. I thought it was an excellent idea. Brian Humphrey helped us in the early conceptual stages. Since then, Ian Smith and Jane have worked hard with Tom Short of Idea Machine to deliver you this product.

Lastly, I would like to sincerely thank our 1995 Journal advertisers:

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I would also like to thank the authors that contributed their technical summaries. To the membership, I encourage you to let us know what you think. We need your feedback so that we can continue to improve your newsletter.

Taras Dziuba
Evaluation of the Debolt Formation of N.E. British Columbia
D.V. Allan, D.G. Tivey, A.K. LaFlamme and D.R. Clenzych

The study was initiated to resolve a difference between material balance reserve estimates and the volumetric reserves calculated from log analysis.

Husky Oil recently undertook an extensive study of Foothills gas reservoirs of the Mississippian Debolt Formation in the Sikanni/Grassy area of N.E. British Columbia. The reservoirs are dolomitized, heavily fractured and have low average porosity. This study was initiated to resolve a difference between material balance reserve estimates and the volumetric reserves calculated from log analysis. Refinement of the petrophysical evaluation was achieved by utilizing data from special core analysis and from the study of drill cuttings from these wells and similar data from the surrounding area.

Five wells were chosen for special core analysis. The measurements were made at ambient and reservoir conditions. These reservoir conditions included temperature and net over burden pressure. Porosity measured at ambient conditions remained effectively unchanged at reservoir conditions, while permeability values were dramatically reduced by a factor of 10 to 1,000. Values of m and n, of Archie's equation, were derived and yielded an average n of 0.94 and m of 1.47. Capillary pressure data, obtained with saturated brine, showed that the gas/water transition zone averaged 150 metres in height and 52% water saturation. Furthermore, irreducible water saturation ranged between 25% and 30% for reservoirs with 1-5% porosity. This data was then compared to a more extensive capillary pressure database which includes the Debolt, Pardonet/Baldonnel and Nahanni/Arniaca formations. Petrographic studies showed that porosity in the Debolt Formation is associated with the presence of fractured dolomite and is comprised of intercrystalline and moldic type porosity. Limestone sections are mostly tight but also locally fractured.
The insights gained from this study were then used to refine the petrophysical analysis in the a-63-H/94-G-3 well. A net pay of 40 metres, with an average porosity of 3.5% and an average water saturation of 27%, would yield a volumetric reserve that best fits the material balance reserve estimate.

The original analysis of the a-63-H well was generated using a deterministic, crossplot driven method which yielded 82 metres of net pay, using a 2% porosity cutoff. A net pay of 38 metres was achieved by applying a volume of dolomite cutoff. This cutoff was justified since the petrographic studies showed that the reservoir was associated with the dolomitized matrix. Although the net pay is fairly close to the desired value, the average porosity was slightly low. Therefore, a more comprehensive analysis technique was utilized. This approach used an inverse matrix type solution, which simultaneously solves for the mineral volumes and pore space fluids, and gives a more accurate matrix corrected effective porosity. A net pay of 39 metres and an average porosity of 3.4% was obtained with this technique.

Water saturation was calculated using a variable m technique, which compares the flushed zone water saturation, from an EPT measurement, to that calculated from the MSFL. This variable m technique resulted in a more desirable average water saturation of 27.5%. The saturation exponent n was set to 2 because of the questionable nature of the core analysis. Core measurements of n are generally less accurate than measurements of m, since n is dependent on fluid properties and reservoir conditions which can be difficult to simulate.

The correlation between images obtained from the Formation Micro Scanner and the evaluation log, were excellent. Pervasively fractured intervals had m values less than 2, while zones with vugs had m values greater than 2.

In conclusion, special core analysis, combined with petrographic studies, improved the petrophysical interpretation by providing calibration points and helping in the selection of the appropriate lithology and porosity cutoffs. In addition, this study clearly highlights the advantages of utilizing the variable m interpretation technique.

1 Husky Oil Operations Ltd.
2 Alberta Energy Company

Happy Holidays and Best Wishes for the New Year from your Friends at CWLS.
Case Study of a Foothills Gas Well

Allan Pickel, Numac Energy Inc.

Good looking logs with thick pay zones are not a guarantee of success.

Production from tight fractures reservoirs can be a problem. Good looking logs with thick pay zones are not a guarantee of success. Grassy a-70-C/94-G-7, drilled by Numac Energy in 1994, is a good example of a disappointing foothills well. Initial production from the Debolt formation was at rates of 9-12 mmcf/d with less than 20% drawdown, yet it produced less than 1 BCF before water ing out.

The displayed logs are from the second wellbore into the structure. The first wellbore penetrated the gas/water contact, then

[Resistivities less than 1000 ohm-m are usually wet as formation water is very fresh due to surface recharge from the west.]

had to be abandoned after the drillstring parted and fishing attempts were unsuccessful. The whipstock well was drilled, logged and then cased without testing. Note the good overall reservoir quality over the interval 1862-1986, with good microlog response and continuous porous dolomite. Note also the lower resistivities in the wet zone below 1939 metres. Resistivities less than 1,000 ohm-m are usually wet as formation water is very fresh due to surface recharge from the west. It is difficult to pinpoint the top of the transition zone as capillary pressure data from other wells indicate a very long transition. The FMI data showed extensive fracturing throughout the formation.

The well initially completed in the upper section from 1820-1850 metres and produced for a few months before pressures declined rapidly. The production strategy was to limit drawdown to 20% to avoid premature water coning which would necessitate a decrease in production rates. Both the pressure and rates continued to decline until the well was no longer capable of commercial rates. The well was then recompleted over the interval 1866-1899 metres on the assumption that the upper perforations were not draining the main reservoir section. The recompletion was a failure as the well now produced water with minor amounts of gas. Explanations for the water production include:

1. The original wellbore provided a pipeline to the water and is directly connected to the producing well through fractures.
2. Water is travelling up through the fractures and bypassing gas in the matrix.
3. A poor cement job.

The Grassy well is currently suspended.
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1996 Technical Luncheons

January
- Dealing with Uncertainties of Log Analysis, Peter Kubic, Petro-Canada

February
- Logging Night in Canada, Annual General Meeting, Ron McLean, Hockey Night in Canada

March
- Formation Evaluation in Horizontal Wells/Some Recent Examples from Shell Canada Wells, Paul Jackson, Shell Canada

April
- Resistivity Anomalies/Opportunities in Slant Wells, Gordon Uswak, PanCanadian Petroleum Ltd.

May
- Modernization and Use of Older Log Data, Bernie Cossette, Teknica Overseas Ltd.

June
- Reservoir Characterization: Integration of Rocks and Well Logs, Dennis Woon, Woon Petrophysical Services, Howie King, Howie King and Associates

September
- Improved Permeability Prediction in Carbonates, Taraz Dziuba, Canadian Hunter

October
- Borehole Imaging, Paul Heffernan, HEF Petrophysical Consulting Inc.

November
- An Engineer and Geologist Compare Notes on Petrophysical Parameters in Clastics, Doug Hilchie, Howie King, Howie King and Associates

December
- Productivity Predictions from Well Logs in Variable Grain Size Reservoirs: The Cretaceous Qishn Formation, Republic of Yemen, Michael Cheng, Canadian Resources International Ltd.

1996 Synergy Workshop
Committee Members

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Chairman’s Remarks
Welcome to the first issue of the CWLS newsletter. The newsletter is dedicated to providing a forum to its members for the sharing of information related to the many aspects of formation evaluation. The newsletter will publish abstracts that provide current and comprehensive analysis of issues that affect explorationists in their day-to-day work. Articles or brief monographs covering the formation evaluation field are most welcome, but are subject to acceptance by the Editorial Committee.

The newsletter will be published quarterly in March, June, September, and December and goes out to all the membership. At the present time, we have yet to determine a newsletter name. Members are asked to join in and help with the naming. As I see it, a contest is the only way to go! So join in, let’s come up with something unique! Stay tuned for this one.

CWLS Annual General Meeting, February 19
Presents
Mr. John Dunn: Tracking Baffin Island by Foot, Ski and Kayak

Mr. Dunn will present through slides and discussion a look at his tracking of Baffin Island, N.W.T.
Mr. Dunn’s work has recently been articulated in National Geographic
Cocktails: 5:00
Doors Open: 6:00
Dinner: 6:30
Presentation: 8:00

for information on tickets, call the CWLS office at 269-9366

1997 Calendar of Events

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<td>Topical Conference</td>
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<td>Joint Convention</td>
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<td>SEG</td>
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<td>Horizontal Well Technology Trade Show</td>
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John Nurkowski, Canadian Hunter

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Rick Mikitka, Archer Resources

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