



CHRIS M.F. GALAS, Ph.D., P.Eng.

Manager, Reservoir Studies

Phone: 1-403-294-5501

Fax: 1-403-294-5570

E-Mail: chris.galas@sproule.com

Chris Galas is the Manager of Reservoir Studies and an Associate of Sproule. He is involved in the management of Sproule's International subsidiary. Chris has been a Sproule professional since 2003 and has experience in Australia, Bahrain, Canada, China, Ecuador, Egypt, India, Indonesia, Iraq, Kazakhstan, Qatar, Russia, Syria, United States, and Venezuela.

Diplomas and Degrees

- ❖ B.A. Natural Sciences (1971), Cambridge University, United Kingdom
- ❖ M.A. Natural Sciences (1975), Cambridge University, United Kingdom
- ❖ M.Sc. Nuclear and Elementary Particle Physics (1975), London University, United Kingdom
- ❖ Ph.D. X-Ray Astronomy (1980), University of Calgary, Calgary, Alberta, Canada

Memberships

- ❖ Association of Professional Engineers, Geologists and Geophysicists of Alberta (APEGGA)
- ❖ Society of Petroleum Engineers (SPE)
- ❖ Petroleum Society of the Canadian Institute of Mining, Metallurgy and Petroleum (CIM)

Work Responsibilities

- ❖ Simulation studies
- ❖ Reservoir characterization
- ❖ PVT and formation evaluations
- ❖ Enhanced oil recovery
- ❖ Deliverability evaluations
- ❖ Integrated studies
- ❖ Presenting courses on numerical simulation topics

Previous Employers

- ❖ 1992-2003 **Galas & Associates Ltd.**, Calgary, Alberta — *President*
 - ❖ Managed company with two employees and up to five sub-contractors
 - ❖ Projects for over 40 corporate clients, with a high percentage of repeat customers
 - ❖ Taught industry course, “The Art of History Matching – Modelling Reservoir Mechanisms”
 - ❖ Carried out over 80 simulation studies and numerous analytical reservoir studies, material balance studies and Alberta EUB applications
 - ❖ Recent evaluation (2003) of studies carried out in early 1990’s showed that predictions from simulation were close to actual field performance. Highlights include:
 - ❖ Reservoir and surface facility models of gas pools for gas storage
 - ❖ Development studies of several heavy oil reservoirs in Venezuela. In one study, multiple realisations were history-matched, leading to multiple predictions for stepout locations – these were used for accurate ranking of locations and the determination of probability of success.
 - ❖ Investigation of CO₂ migration across lease boundaries in Weyburn CO₂ miscible flood
 - ❖ Evaluating methane, ethane or CO₂ injection into a heavy oil reservoir, Wabiskaw ‘A’ Formation
 - ❖ Modelling of horizontal wells in Halfway Formation gas/oil pools, utilising geo-statistics to model reservoir heterogeneity and also used geostatistical realisations to quantify uncertainty in performance of proposed step-out wells.
 - ❖ Incorporating detailed reservoir characterisation into model of Basal Quartz pool to optimise waterflood.
 - ❖ Modelling a horizontal gas well being drilled under-balanced to determine cause of low production while drilling. Simulation was carried out while well was being drilled.
 - ❖ Modelling part of giant field in Western Siberia, including complex system of regional sands cut by thick fluvial channels to generate plan to increase recovery from regional sands.

- ❖ 1981-1991 **BP Resources Canada Ltd.**, Calgary, Alberta — *Engineer*
 - ❖ 1990-1991 *Senior Reservoir Engineer, Petroleum Engineering*
 - ❖ Responsible for analysis of reservoir performance and optimal development recommendations
 - ❖ Designed and monitored laboratory programs for chemical flood pilot

 - ❖ 1990 *Acting Leader, Reservoir Projects Group*
 - ❖ Responsible for studies conducted in group, supervising four engineers.

 - ❖ 1988-1990 *Senior Reservoir Engineer, Conventional Oil and Gas Department*
 - ❖ Carried out reservoir optimisation studies using both classical and simulation methods.

- ❖ 1985-1988 *Senior Reservoir Engineer, Experimental Projects Group, Oil Sands Department*
 - ❖ Provided continuing reservoir engineering support for thermal EOR pilots. This included an extended period in the field for monitoring and modifying daily operations associated with oxygen injection.
- ❖ 1984-1985 *Evaluations Co-ordinator, Business Development, Oil Sands Department*
 - ❖ Responsible for all economic evaluations in Oil Sands Department
- ❖ 1981 - 1984 *Reservoir Engineer, Simulation Group, Oil Sands Department*
 - ❖ Carried out numerical simulations of thermal EOR projects, including the Marguerite Lake Combustion project and the Wolf Lake Cyclic Steam project

Publications

- ❖ Galas, C. M. F., "The Art of History Matching – Modeling Water Production under Primary Recovery", Paper 2003-213, presented at 2003 Petroleum Society of the CIM Annual Technical Conference and Exhibition.
- ❖ Galas, C. M. F., "The Future of Reservoir Simulation", Guest Editorial, Journal of Canadian Petroleum Technology, 36, No. 1, Jan. 1997.
- ❖ Potocki, D., I. Raychaudhuri, L. Thorburn, C. M. F. Galas, H. King, "Integrated Reservoir Characterization of a Heterogeneous Channel Sandstone: The Duchess Lower Mannville X Pool", presented at 1997 Petroleum Society of the CIM Annual Technical Conference and Exhibition.
- ❖ Galas, C. M. F., "Reservoir Characterization in Numerical Simulation", presented at SPE Applied Technology Workshop "Integrated Reservoir Characterization", Calgary, 24-25 October, 1996.
- ❖ Galas, C. M. F., "Reservoir Parameter Estimation by Material Balance", presented at 1994 Petroleum Society of the CIM Annual Technical Conference and Exhibition.
- ❖ Galas, C. M. F., P. L. Churcher and K. Olsen-Heise. "Numerical and Geological Modeling to Predict Horizontal Well Performance, Weyburn Unit, Saskatchewan", presented at Fifth Saskatchewan Petroleum Conference, Regina, October 18-20, 1993.
- ❖ Galas, C. M. F., T. J. Mullane, P. L. Churcher, R. O. Baker and S. Elsayed. "Development of the Weyburn Unit, S.E. Saskatchewan, with Multiple Horizontal Wells", presented at SPE/CIM/CANMET International Conference on Recent Advances in Horizontal well Applications, Calgary, March 21-23, 1994.
- ❖ Galas, C. M. F., P. L. Churcher and P. Tottrup. "Predictions of Horizontal Well Performance in a Mature Waterflood, Weyburn Unit, S.E. Saskatchewan", Journal of Canadian Petroleum Technology, 33, No. 9, November 1994, 29.
- ❖ Galas, C. M. F. and Ejiogu, G. C., 1991, "Enhancement of In-situ Combustion by Steam Stimulation of Production Wells", S.P.E.R.E. November 1993.

- ❖ Galas, C. M. F., Ejiogu, G. C. and Donnelly, J. K., "Fluid and Heat Movements During In-situ Combustion in a Channeled Reservoir", Journal of Canadian Petroleum Technology, 30, No. 3, May-June 1991, 42.
- ❖ McGee, B. C. W., Hallam, R. J., Nzekwu, B. I., and Galas, C. M. F., 1988, "A Pressure Observation Well for Monitoring and Optimizing the Pressure-up/Blowdown Process", Fourth UNITAR/UNDP Conference.

Professional Experience in Hearings, Arbitrations and Litigations

My experience falls under two headings:

- A. The provision of technical support in a proceeding, with or without the preparation of evidence but without appearance as an expert witness.

A. TECHNICAL SUPPORT FOR HEARINGS, ARBITRATIONS & LITIGATIONS:

1. Turgai Petroleum v PetroKazakhstan Kazakhstan, 2005:
 - a. Forum: Kyzylorda Oblast Court, Kyzylorda, Kazakhstan and Kazakh Supreme Court; Astans, Kazakhstan
 - b. Issue: Claimant claimed damages of US \$200 million claiming Defendant had caused oil to migrate from Claimant's License Area to Defendant's License Area.
 - c. Legal Counsel: Salans
 - d. Sproule audited a technical report prepared by a third party and prepared a report to refute the technical conclusions.
 - e. Outcome: Oblast court awarded damages totaling US \$200 million. This was reduced to US \$25 million by the Supreme Court.