

WCB — THE LITTLE OIL PATCH THAT COULD

By Bob Knoll

In terms of crude oil production, Canada is a relatively minor league player, ranking 14th among producing countries with 2.5% of the world total — Table 1 (Ref. 1). If considering the two largest producing provinces in the WCB (Western Canadian Basin) alone, Alberta would rank approximately 21st with less than 1.3% of world total. Saskatchewan produces roughly half that of Alberta, and would be on a par with Yemen (30th). Yet the WCB industry holds a globally dominant position in the key innovative exploitation technology (h-wells — horizontal wells) and plays a major role in the related technical pursuits (UBD – Underbalanced Drilling, ERD — Extended Reach Drilling, coiled-tubing and multi-branch technology).

TABLE 1

Ranking of top 30 crude oil producers in 1998, million bbls/day (excluding NGL's and Bitumen)

Rank	Country	Production	Percentage**
1	Saudi Arabia	8.1	13.1
2	U.S.A.	6.4	10.4
3	Russia*	6.1	9.8
4	Iran	3.6	5.8
5	China*	3.2	5.8
14	Canada	1.6	2.6
21	Alberta	0.8	1.3

*Non-OECD producing countries, NGL's contribution are not defined.

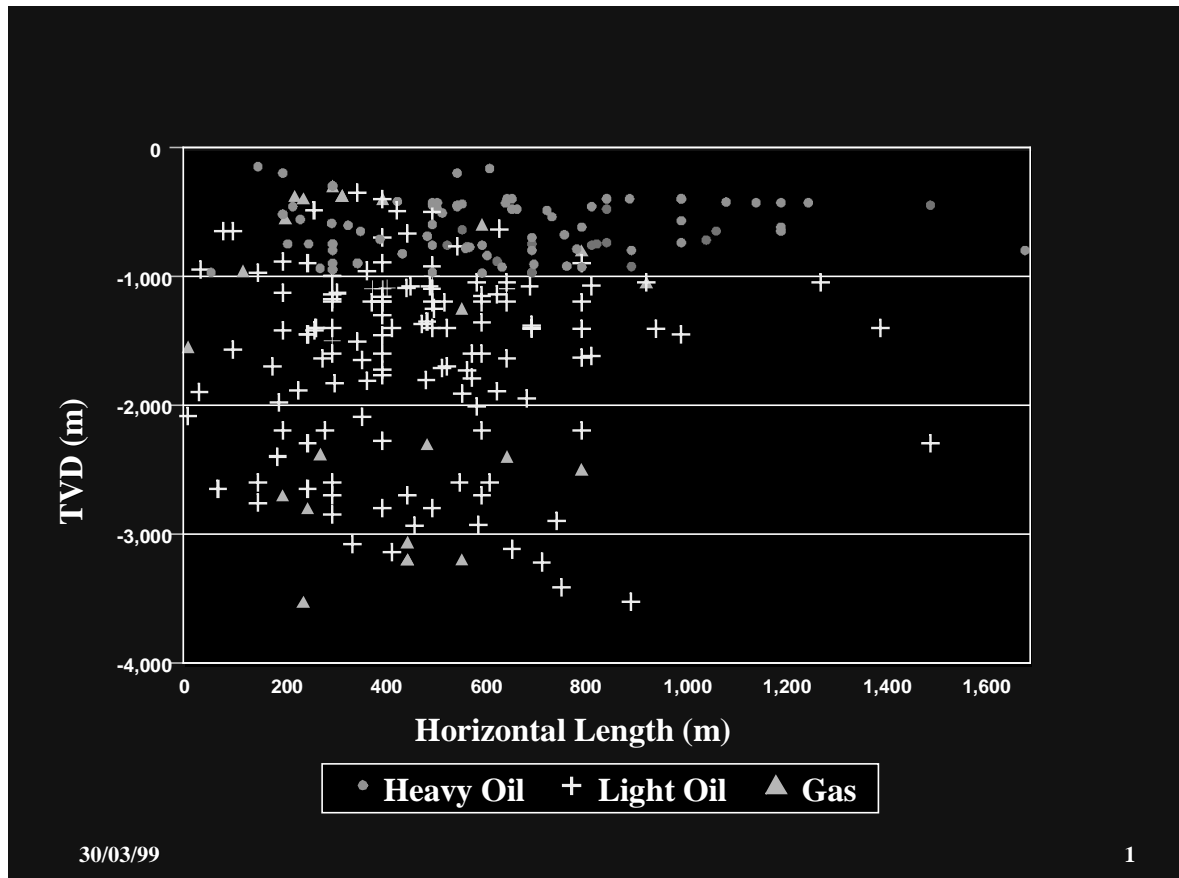
**The percentage of total top 30 production of 61.7million bbls/day.

Domination by Numbers

In terms of scale of application of h-wells, the WCB is a world leader. Saskatchewan alone has in excess of 3,300 h-wells. Alberta, with over twice the resource base of Saskatchewan, has a 5,300⁺ h-well population. Collectively, the WCB claims a total approaching 10,000 wells, perhaps in the range of 40 to 60 per cent of the world total (Ref. 2). The world share can only be approximated since h-well statistics are not readily available from many producing regions.

Why is it that a region producing less than 2.5% of the world's crude would have a dominant position in the application of this advanced exploitation method? Outside observers might assume that the basin is characterised by one major reservoir type which is particularly conducive to h-well applications (e.g., the Austin Chalk of Texas). They may perceive that the application was championed by a large operator applying the technology to relatively huge fields (e.g., Statoil in Norway, or ADNOC in the U.A.E). On the contrary, the WCB is extremely diverse.

Figure 1 provides a sample cross-section of h-wells drilled in the WCB in the period 1989 to 1993, the formative years of this technology in Canada. The TVD (true vertical depth) of these reservoirs vary from 10's of metres to a number of kilometres. There is almost every conceivable type of hydrocarbon production (bitumen to deep sour gas), in many varied structures and lithologies. All the production processes are employed from primary through to the most advanced EOR (Enhanced Oil Recovery) methods, such as steam assisted gravity drainage (SAGD).



In comparison to the world's major producing areas, the WCB would be described as a region of relatively thin, varied, depleted reservoirs of limited reserves and meagre profit margins. In Saskatchewan for example, pay zones frequently have net pay of less than 5 metres. Yet, in this marginal setting, oil production has increased over 90% in the last decade in large part due to the exponential growth of h-well applications (Ref. 3). It is valid to state that, in general, the thinner the reservoir, the more attractive an h-well vs. a vertical well. However, it is simplified to suggest that a world technical dominance is solely resultant of a minor producing region having small, thin, depleted reserves in a very marginal profit setting. The WCB is not the only area in the world with thin pay zones. There must be other factors at play.

Diversity Breeds Innovation

The WCB industry is diverse in terms of operator culture, from major multi-nationals to hundreds of intermediate and junior companies. It is characterized by a strong entrepreneurial spirit. The right-sizing and core-asset focus of the last decade has spawned many small operator

entities with only one, or a few relatively tiny fields to exploit. In fact, many of the application breakthroughs were championed by the smaller companies. Confronted by low profit margins, and being in a competitive state in the equity market, forced these small operators to identify specific exploitation niches to attract capital investment. Thus, h-wells were adapted to many varied resource types resulting in site-specific optimization. Parallel to this is the extreme competition in the service supply sector.

Competition Demands Competence

In Calgary, there are approximately 26 directional drilling vendors, compared to the U.A.E. industry (world rank 10th) where there may be less than 6 vendors vying for the h-well market. This level of competition forces the service suppliers to adopt rapidly and incorporate only that technology which clearly adds value. The typical WCB well cost has 7 or less figures, thus one must be very prudent when considering high-end technology. The industry relies heavily on the technical competence of the service providers, and insists that only what is fundamentally required be applied. Still, many of the top-end technologies are first developed here.

The Perfect Testing Bed

The variance in reservoir setting and corporate culture, the entrepreneurial spirit, a competitive service market, extremes of environment, a relatively stable political and economic framework close to the largest diversified markets (USA), all combine to make the WCB an excellent arena to field trial new technologies. There is an extensive list of innovations and tools which were conceived and developed in Canada, which are marketed globally. Northland, Sperry Sun, TESCO, Rebound, etc., are all examples of entities which manufacture in Canada, relying on the innovative spirit of the WCB industry to field trial, fine-tune, and prove their products prior to global introduction.

Parallel to the hardware export, there is a disproportionate number of Canadians holding senior technical positions in the upstream side of the global industry. The WCB exports people and expertise at an impressive rate. These people tend to be very technically versed and adaptive. The underlying co-operative spirit of the WCB industry promotes the development of this unique skill pool.

Networking Pays Dividends

Calgary and surrounding area is the corporate centre for the WCB industry. Most of the service and operating companies are officed in a relatively small down-town core. This proximity, with state-of-the-art infrastructure, allows a great degree of communication in a very fluid work environment. It is said you could get all the service and operators reps together in one room in less than 30 minutes. Just imagine trying to do that in Houston, let alone Jakarta. The regulatory agencies, led by the S.E.M. (Saskatchewan Energy & Mines) have pro-actively worked with the industry to evolve both operating and fiscal regimes which promote technical advance. The industry is unique in terms of the many publicly accessed data bases of non-proprietary information conceived and administered to promote technology transfer. The regulators work hand in hand with industry volunteer groups to constantly adapt the rules of the game as the technology evolves.

There are numerous organizations which sponsor regular luncheon meetings, forums, seminars, etc., to advance specific technical issues. As example, the Canadian Operator Group of DEA-44 (Drilling Engineering Association - Horizontal Technology Project) has been active since 1987 as a focal point of a horizontal technology exchange co-operative. This networking is more pronounced in the WCB industry than anywhere else in the world.

What about Wytch Farm?

Drilling Engineers will sometimes challenge the Canadian claim of world leadership in horizontal technology, often citing the ERD accomplishments most notable in southern England. This 10± kilometre departure wells are very impressive. The ratio of length to depth helped spawn the development of Rotary Drilling Options and many other innovations in ERD. Assuming the reader appreciates the technical challenge evoked by the acronyms; compare Wytch Farm with the SAGD developments in Alberta. This exploitation setting demands twin, parallel, thermal EOR, ERD wells. They have length to depth ratios in the 3 to 6 range at a very shallow setting (100 to 500 metres TVD). The shallow depth challenge is further compounded by an overburden dominated by erratic glacial till, and a pay zone of unconsolidated sand prone to solids production and well distortion problems. The parallel well pairs must be placed within extreme tolerance of TVD separation (e.g., within 1 to 2 metres), over lengths up to 1 km. The wells are uniquely tubular intensive, sometimes employing multiple insulated concentric instrumentation and production/injection strings; which must be capable of surviving manipulation in an environment of thermal and phase cycles, and sour produced fluids.

If this does not impress the Petroleum Engineer as the ultimate technical challenge, consider the fact that the original pilots of these wells were drilled upside down from a mineshaft underneath the bitumen pay zone. But that's another story.

Conclusion — Canada's Oil industry leadership in exploitation technology is not simply the result of having thin, marginal depleted reservoirs. It is promoted by a combination of many factors, including a collective spirit of co-operation and innovation which are particularly evident in the relative minor oil producing industry of the WCB. The unique aspect of this industry has allowed a minor league producing region to achieve a dominant global position in the scope and diversity of advanced exploitation technology.

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About the author: R.G. (Bob) Knoll is President of H-Tech. in Calgary, and the Canadian



representative for Maurer Engineering Inc. (MEI) — the managing group for numerous DEA joint industry projects. Bob’s 25-yr. career is uniquely diverse. A graduate Geologist from Nova Scotia, he started off as a Maintenance Roustabout on first generation semi-submersibles operating offshore Canada. After working up the drilling contractor side of the industry to a Tool-pusher level on offshore drilling projects globally, Bob moved over to the operator side as a Drilling Engineer for Dome Petroleum in the high Arctic. Another series of global postings and advancement to OIM level led to a Senior Drilling and Completions Specialist position for Husky Oil in Calgary, studying emerging horizontal well technology.

In 1987 Bob formed H-Tech. and immediately became Canadian liaison for the DEA-44 Horizontal Technology Project. In that role he conducts well design, project management, technical audits, well history reviews, expert witness, etc., on horizontal well applications around the globe. In 1991 he initiated a technical training program for the DEA-44 project members on multidisciplined horizontal well technology, and since then has authored and delivered over 120 technical training programs to over 3,500 Managers, Engineers, and Earth Scientists in every major oil and gas area in the world.