

Emerging Solutions for Heavy Oil Production from Carbonates

A discussion paper prepared for TAMM Oil and Gas Corp.

by Don W. Hryhor - October 1, 2008

Introduction

It has become increasingly attractive for the oil industry to turn its attention to developing effective exploitation and production techniques for known heavy oil deposits, due to the current decline of conventional oil reserves and strong commodity prices.

Advances in heavy oil recovery technology and production methods in Western Canada have been targeted towards Basal Cretaceous sand reservoirs, due to the enormity of these deposits, which are estimated to contain 1.7 trillion barrels Original Oil in Place (OOIP). (*ref: 1 & 2*)

Carbonate Triangle

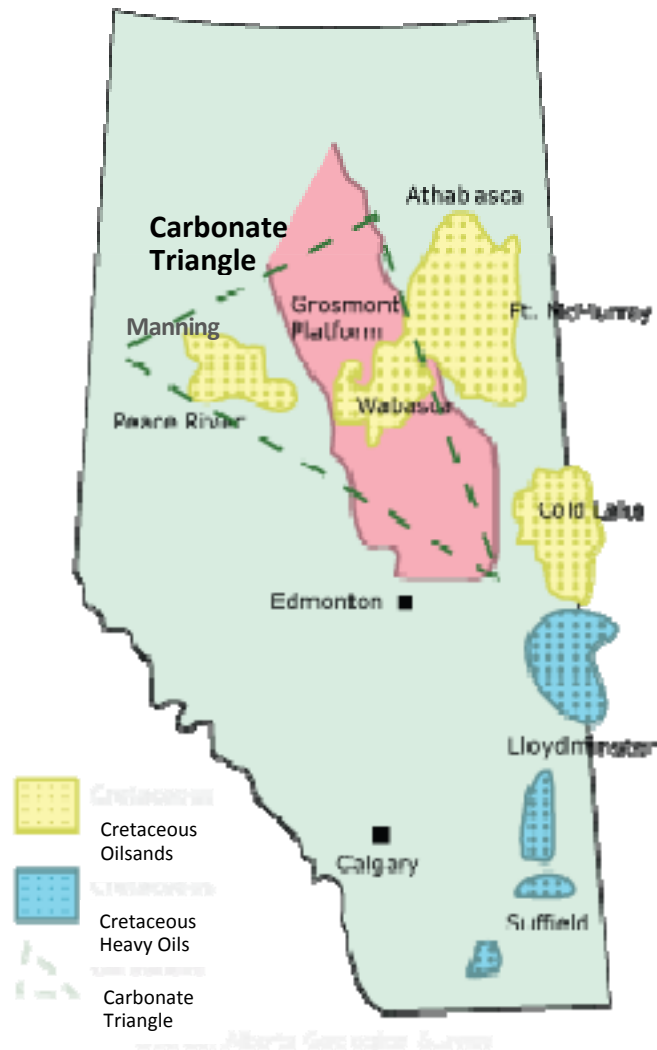
Considerable attention is currently focused on the large heavy oil deposits in the "Carbonate Triangle" of northeastern Alberta as displayed on the map to the right.

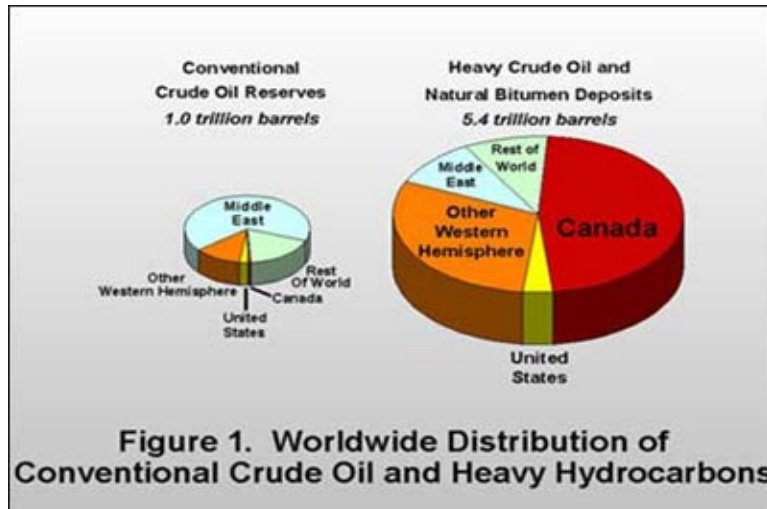
The Upper Devonian aged Grosmont formation has been the main focus of interest because of its enormous heavy oil reserves, estimated in the range of 300+ billion barrels OOIP.

It is anticipated the Grosmont will be a particularly challenging reservoir because of its complex heterogeneity, caused by faulting and karstification.

Extensive research is being directed towards new solutions to recover heavy oil and bitumen from carbonate rocks, which has shown considerable promise in similar reservoirs through other parts of the world.

Effective new solutions are rapidly emerging at a markedly accelerated pace, as compared to efforts in oil sands recovery technology developed over the last two decades.





<http://www.megawestenergy.com/tech/index.html>

The figure shown to the left illustrates that Western Canadian bitumen reserves represent about 45% of the world total.

Although the large majority of these heavy oil reserves are in Cretaceous sands, considerable reserves are also hosted within carbonate rocks (limestones).

Alberta is destined to become the largest heavy oil production and development center in the world.

In global markets of high energy pricing and demands, industry is focused on innovative solutions to address effective exploitation of heavy oil from carbonate reservoirs, as was successfully accomplished with heavy oil sands. Recently developed in situ bitumen extraction techniques will allow industry to leap-frog through this challenge.

Numerous oil companies are now aggressively focused on land acquisition and project assessment of the northern Alberta Grosmont formation heavy oil accumulations. In early 2006, Shell E&P Company paid \$465,000,000 for a total 88,576 hectares of leases (*ref: 3*) considered to be prospective for Grosmont heavy oil. Husky (*ref: 4*) recently began evaluation drilling and production testing on their Saleski Grosmont heavy oil properties. Laricina Energy made application to drill two horizontal wells in the Grosmont for a SAGD pilot project at Saleski this coming winter. (*ref: 5 & 6*)

Carbonate Heavy Oil Production in the Global Arena

In the late 1990's, Scimitar Hydrocarbons began efforts to develop the Issaran Heavy Oil Carbonates in Egypt by in-situ application of heat and steam. This project was initially viewed with considerable cynicism, but was ultimately a highly successful venture for Scimitar's successor Rally Energy (*ref: 7*) who sold their interest in the field back to the Egyptian Government last year for \$900,000,000.

Heavy oil is being produced from Carbonates in the Bashkir Romashkino oil field in Tatarstan using a microbial improved oil recovery (*ref: 8*) from fractured porous carbonate reservoirs by the application of molasses and bacteria. This application appears to be more effective in carbonates than with sand reservoirs since carbonates neutralize generated organic acids, which intensifies the formation of microbial bacteria, and therefore increasing permeability.

In May 2007, Petroleum Development Oman awarded two major engineering, procurement and construction contracts for the Qarn Alam (16 API) steam-injection project. (*ref: 9*) This project

includes drilling some 150 wells and installing facilities to treat water and generate around 18,000 tonnes per day of steam. The EOR recovery process being applied TAGOGD (thermally assisted gas/oil gravity drainage) is based on injecting steam into the formation's fractures to heat the low-permeability oil-bearing rock. It is expected this technology will result in an increase of recoverability from 4% to approximately 30%. Petroleum Development Oman is owned by the Government of Oman (60%), the Shell Group (34%), Total (4%) and Partex (2%).

Horizontal drilling in the Rospo Mare carbonate heavy oil field in the Italian Adriatic has been successful in significantly increasing heavy oil production up to ten times that of vertical wells. Recent drilling in the nearby Ombrina Mare carbonate heavy oil field has been encouraging and plans are underway to develop heavy oil production from the Ombrina Mare Field at a projected 8,000 – 13,500 BOPD. (*ref: 10, 11, 12*)

Stream Oil and Gas is currently working to revive the Albanian Gorischt-Kocul carbonate heavy oil field (15 API) field with a staged rehabilitation program on 13 producing wells in the field and has taken over another 14 for reactivation. Gorischt-Kocul production is around 925 BOPD. Stream is also actively rehabilitating the Ballsh-Hekaj heavy oil field (11 API), a carbonate field currently producing 550 BOPD. (*ref: 13*)

The Kuwait Oil Company (“KOC”) and ChevronTexaco have recently drilled numerous new wells to evaluate the Tayarat carbonate heavy oil reservoir. (*ref: 14*)

KOC has initiated a comprehensive data acquisition program to further evaluate this reservoir as part of their long term resource assessment. Analysis of core and log data and information from other regional oil reservoirs in this formation have demonstrated that primary oil production is possible in some locations.

Chevron (*ref: 15*) is conducting an initial testing program in Saudi Arabia involving one steam-injection well, and four producing wells with one observation well to collect data about the interaction of the oil and steam. Though declining to give a timetable, Chevron is committed to expanding to a larger second phase that will include 16 injection wells and 25 producing wells in addition to the installation of water-treatment facilities and steam-generation facilities. The total estimated cost of their project is \$300 million.

Tanganyika Oil Company (acquired by Sinopec) is producing heavy oil from the Tishrine field, averaging between 17° and 19° API. (*ref: 16*) There are currently 114 wells operating in three fractured limestone reservoirs: the Chilou, Jaddala and Shiranish. Horizontal wells have been used successfully to produce the Chilou and Jaddala reservoirs since 1998.

The Tishrine field is separated into two lobes that produced over 6,300 BOPD on average, for most of 2005. Tishrine West consists of 247 wells, of which 111 were producing 5,273 BOPD of 17 °API oil from the Chilou and Jaddala carbonate heavy oil reservoirs as of December 2005.

The giant Cantarell heavy oil field in the Mexican Yucatan (*ref: 17*) produces from a fractured carbonate reservoir at a present rate of 1,500,000 BOPD. Chicontepec, an undeveloped heavy oil field north east of Mexico City, is actually larger than Cantarell. Its original oil in place is

greater than 139 Billion barrels, of which 7% to 10% (10-13Gb) are currently recoverable using existing available technology.

Productive heavy oil carbonate fields have been be grouped into two categories: 1) low matrix permeability, fracture dependent and 2) matrix permeability dependent production. Fracture enhanced, low matrix permeability production is dominant and occurs in Oman, Iran, Iraq, Syria, Turkey and Egypt and includes producing fields such as Qarn Alam in Oman and Issaran and Bakr-Amer in Egypt. (*ref: 18*)

In Iran, several fractured carbonate fields have successfully cold tested oil qualities on the order of 10 degree API. Wafra, located in the Divided Zone of Kuwait and Saudi Arabia, is the most notable example of an accumulation that has ample matrix permeability to allow economic cold production without significant fracture enhancement.

Schlumberger (*ref: 19*) has become a recognized world leader in assisting industry to develop and implement innovative, cost effective heavy oil and bitumen production from various carbonate reservoirs around the world. Schlumberger has recognized the importance of heavy oil carbonates and has recently set up dedicated offices to provide their expertise in this area.

It is also reported that Halliburton is involved in testing new recovery and production techniques, and is conducting significant research in varied enhanced recovery solutions, to help industry capture these important carbonate heavy oil reserves throughout the world.

Carbonate Heavy Oil Production in Western Canada

Little attention has been focused on developing recovery techniques for heavy oil carbonates in Western Canada during the last two decades. A few pilot projects to evaluate the Grosmont were undertaken primarily by Unocal, Chevron and Husky during the 1970's and 1980's. (*ref: 20*)

Initial single well cyclic steam injection testing yielded positive results, but it was not considered worthwhile pursuing considering the volatile oil price declines during the early 1980's, which eventually culminated in the oil price crash in 1986.

In the past 3 years, considerable new investment has been directed at bitumen bearing Grosmont targets in Alberta. Large amounts of capital have been spent on land acquisition, exploratory drilling and production research and testing. Several companies have announced plans to further evaluate and begin new pilot production testing programs in the Grosmont. (*ref: 21*)

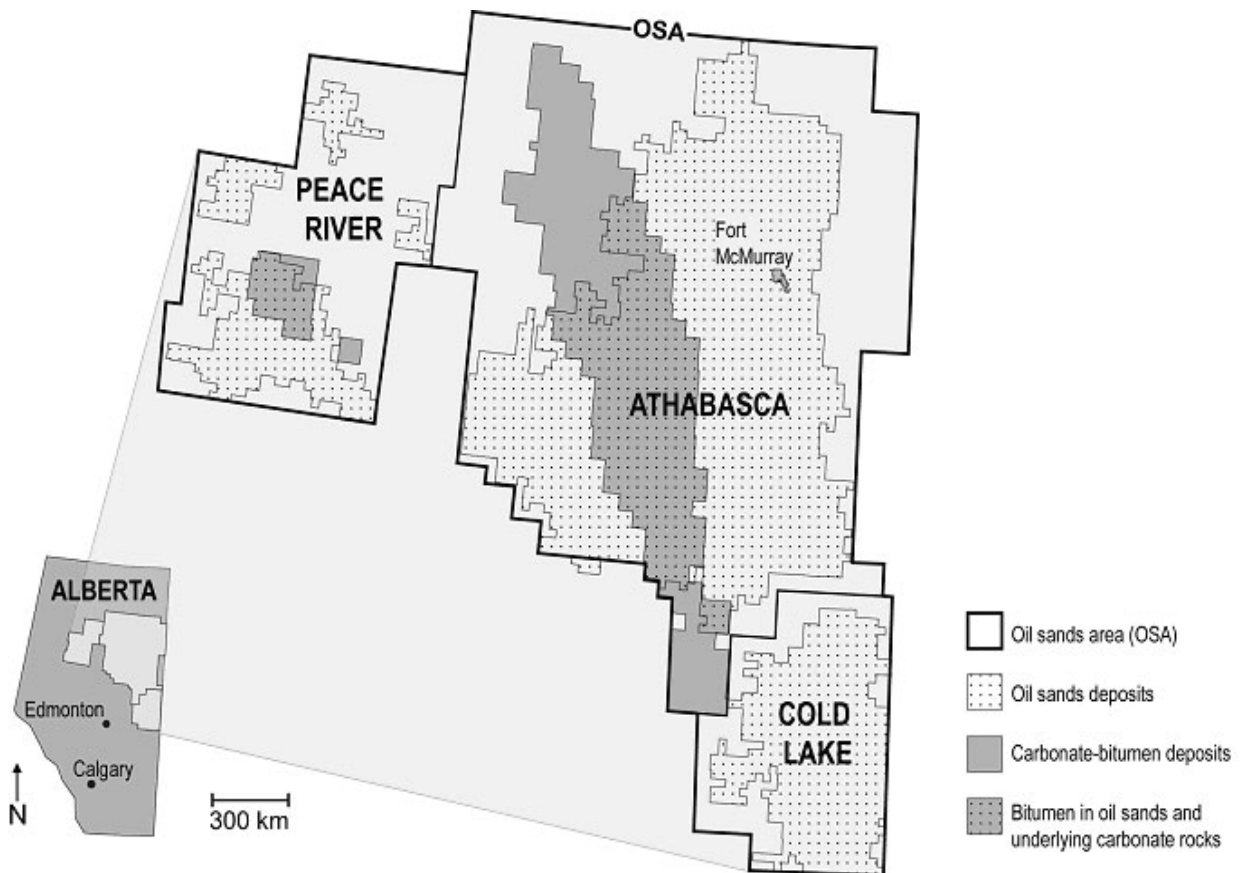
New heavy oil production is currently being established from Mississippian carbonates in the Peace River region at Chipmunk, Seal and Cadotte/Carmon Creek. Several companies have become aggressively involved in the emerging Peace River Mississippian carbonate heavy oil play in new lease acquisition, seismic, exploratory and delineation drilling, reservoir stimulation testing, and heavy oil production.

Substantial heavy oil production has been developed in the Peace River area from the Cretaceous Bluesky and Gething sands, in contact with underlying oil bearing Mississippian source rocks.

Alberta Crown Heavy Oil Leases in the Peace River area generally cover all zones from the Base of the Cretaceous Peace River Formation (above the Bluesky/Gething) to the base of the Mississippian Pekisko Formation; hence the leaseholder has the right to produce from any and all zones held under the Lease.

As of July 2008, the Bluesky/Gething zones in the Peace River region have produced a total cumulative 95,000,000 barrels of oil and 1.78 TCF of gas with 308,000,000 barrels of water from a historical well count of 2,906 wells. During June/July 2008 the Bluesky/Gething produced an average 42,200 BOPD and 212 MMCF/D with 60,000 BWPD from 1,280 producing wells.

Peace River – Mississippian Carbonate Heavy Oil Belt



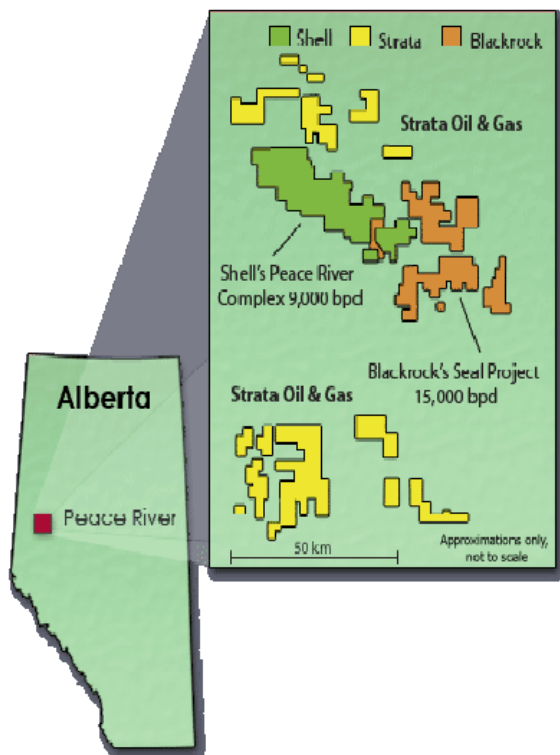
Location map of main bitumen deposits, Alberta, Canada

<http://www.searchanddiscovery.net/documents/2008/08017hein/images/fig01.htm>

The Mississippian carbonates (Debolt, Elkton, Shunda and Pekisko formations) in the Peace River area are estimated to contain approximately 65 billion barrels OOIP. (ref: 10 & 21)

Alberta Oil Sand Lease Sales have become active in the Peace River area during recent years, with specific attention being targeted towards the Mississippian Carbonate Heavy Oil potential. The following table lists Alberta Crown Oil Sands Leases sold from 2000 – 2008.

Year	ATHABASCA & GROS MONT AREA			PEACE RIVER AREA		
	Bonuses	Hectares	Avg\$/Ha	Bonuses	Hectares	Avg\$/Ha
2008	\$233,918,062	1,105,134	\$211.66	\$7,108,300	142,820	\$49.77
2007	\$622,134,141	1,034,642	\$601.30	\$20,099,280	89,856	\$223.68
2006	\$1,921,470,846	1,329,677	\$1,445.07	\$35,088,400	196,741	\$178.35
2005	\$421,879,187	188,464	\$2,238.51	\$9,996,968	158,908	\$62.91
2004	\$71,659,253	170,624	\$419.98	\$9,227,873	110,260	\$83.69
2003	\$3,709,066	8,704	\$426.13	\$8,759,220	42,240	\$207.37
2002	\$17,383,031	126,592	\$137.32	\$6,815,818	39,360	\$173.20
2001	\$79,714,228	199,069	\$400.43	\$1,538,837	27,840	\$55.30
2000	\$135,131,595	147,952	\$913.35	\$769,583	24,320	\$31.60



Black Rock Ventures (acquired by Shell) and Talisman’s recent discoveries at Chipmunk show good promise for further exploration and development of Peace River Mississippian carbonate heavy oil deposits. (ref: 2)

Black Rock announced their first 3 successful Pekisko wells in March 2005, reporting the three wells were capable of producing 960 BOPD of 11 degree API heavy oil. These reservoirs are described as reef-like features. Black Rock had identified 78 similar seismic features on their 65,000 acre holdings.

In September 2007, Strata Oil & Gas Inc. announced a new “Major Bitumen Resource” on their Cadotte Block near Peace River. An independent analysis of the 29 section block held by Strata indicated a “Best Estimate” of discovered resources to be 1.5 billion barrels OOIP in the Mississippian Debolt formation, and estimated 490 million barrels OOIP in the Mississippian Elkton formation. (ref: 3)

In May 2008, Blacksteel Oil Sands Inc. (ref: 4) released a “Resource Estimate” of their Whitemud properties, to the north of Peace River reporting a combined 1.13 billion barrels OOIP, primarily within the Mississippian Debolt and Elkton formations.

Conclusion

Shell, ExxonMobil, ChevronTexaco and others have been achieving successful production and yield from carbonate heavy oil reservoirs globally and have declared the intent to substantially acquire, grow and develop carbonate heavy oil assets in the near future. The technology for recovering heavy oil in carbonates is rapidly advancing, and large E&P companies have been assertively positioning themselves to exploit these reservoirs.

Ivanhoe Energy has recently made great advances in innovative proprietary heavy oil production technology, and is firmly dedicated to become a significant new player in the research and development of increased efficiency in the exploitation of heavy oil carbonates.

In the past, oilfields containing “easily recoverable reserves” were relatively easy to find, hence making heavy oil pools or challenging reservoirs unappealing. Today the oil industry is focussed on developing technical exploitation solutions in already known oil reservoirs. This trend will undoubtedly continue for decades to come.

Industry players have been aggressively acquiring large land positions, and started evaluation drilling, development drilling, and producing heavy oil from Mississippian carbonates in the Peace River region and this activity is rapidly moving towards the Manning area.

The TAMM heavy oil properties at Manning, Alberta in the Peace River region are considered to be favourable for the exploitation of heavy oil hosted in Cretaceous sands and Mississippian carbonate formations. An independent evaluation of TAMM’s Manning properties resulted in a determination of a total 2.33 billion barrels of original heavy oil in place.

TAMM’s strategic land program resulted in the successful acquisition of this key position at Manning during the last year and will directly benefit from competitors’ activities in future exploration drilling and development on adjoining lands.

The prospective heavy oil reserves at Manning, and indications of deeper conventional oil potential justifies an aggressive, continued lease acquisition, coupled with seismic studies and exploration drilling programs by TAMM.

The reader is encouraged to view the following links related to this discussion. These web sites are current as of printing of this discussion paper; the author takes no responsibility for the links after this date.

DISCLAIMER

This discussion paper contains forward-looking statements. The words or phrases "would be," "will" "intends to," "will likely result," "are expected to," "will continue," "is anticipated," "estimate," or similar expressions are intended to identify "forward-looking statements." Actual results could differ materially from those projected in the Corporation's proposed oil and gas related business. This discussion paper and its findings are not necessarily prepared in conformity with SEC disclosure principals or guidelines. The Corporation's business is subject to various risks, which are discussed in the Corporation's filings with the US Securities and Exchange Commission. The Corporation's filings may be accessed at www.sec.gov.

Statements made herein are as of the date of this discussion paper and should not be relied upon as of any subsequent date. The Corporation cautions readers not to place reliance on such statements. Unless otherwise required by applicable law, we do not undertake, and we specifically disclaim any obligation, to update any forward-looking statements to reflect occurrences, developments, unanticipated events or circumstances after the date of such a statement.

Bibliography - References

- 1. Current and Future Perspectives on Recovery Growth from the Western Canada Sedimentary Basin***
By Kirk G. Osadetz and Zhuoheng Chen¹ - Search and Discovery Article #10141 (2007)
<http://www.searchanddiscovery.net/documents/2007/07115osadetz/images/osadetz.pdf>
- 2. Overview of the Oil Sands and Carbonate Bitumen of Alberta: Regional Geologic Framework and Influence of Salt-Dissolution Effects**
By F.J. Hein, R.A. Marsh, and M.J. Boddy - Search and Discovery Article #10145 (2008)
<http://www.searchanddiscovery.net/documents/2008/08017hein/index.htm>
<http://www.searchanddiscovery.net/documents/2008/08017hein/images/hein.pdf>
- 3. Carbonate Klondike – The Next Oilsands?**
Pat Roche – July 2006
http://www.cbp.ca/eventsPages/PDF/KRW07/W5_NTM_CarbonateKlondike.pdf
- 4. Reservoir Characterization of the Grosmont Formation at Saleski, NE AB**
Emmanuelle Piron Husky Energy, Calgary, AB
<http://www.geoconvention.org/2008abstracts/086.pdf>
- 5. Oilsands Review Feb 2008**
David Theriault gives Laricina Energy an experienced hand in entering new frontiers
<http://www.oilsandsreview.com/articles.asp?ID=524>
- 6. Bitumen Mobilization in an Oil-Wet, Fractured Grosmont Carbonate**
Cimolai, Edmunds, Barrett, Solanki, S.C. (Laricina Energy), Kantzas, Duan, (TIPM Lab, U of C)
<http://www.laricinaenergy.com/investor/tech/GPS%20Bitumen%20Mobilization.pdf>
- 7. Rally Energy Reports New Discovery at West Issaran in Egypt**
April 9, 2007
http://www.rallyenergy.com/Site_Files/My_Files/News%20and%20Financials/PR%20-%20April%209,%202007.pdf
- 8. Microbially improved Oil Recovery from carbonate Reservoirs**
Microbial Enhanced Oil 1987, Ed. Thomas E. Burchfield and Rebecca S. Bryant
http://www.microprolabs.de/Mior_93.pdf
- 9. Steam Injection in Fractured Carbonate Reservoirs**
JPT (Journal of Petroleum Technology) • APRIL 2007
<http://www.spe.org/spe-app/spe/jpt/2007/04/SteamInjection.htm>
- 10. Mediterranean Oil & Gas - Ombrina Mare 2 Update**
Wed May 7, 2008 3:39am EDT
<http://www.reuters.com/article/pressRelease/idUS79593+07-May-2008+RNS20080507>
- 11. Rospo mare field : A unique experience of heavy oil production**
Authors: GAUCHET R. and CORRE B.
<http://cat.inist.fr/?aModele=afficheN&cpsidt=6279266>
- 12. Rospo Mare Field--Italy Apulian Platform, Adriatic Sea**
http://209.85.173.104/search?q=cache:FvcVTot_O_IJ:search.datapages.com/data/specpubs/fieldst4/data/a024/a024/0001/0000/0029.htm+rospos+Mare+heavy+oil+field+in+the+Adriatic&hl=en&ct=clnk&cd=5&gl=ca029.htm+rospos+Mare+heavy+oil+field+in+the+Adriatic&hl=en&ct=clnk&cd=5&gl=ca

- 13. Stream lists on TSX-Venture Exchange and updates Albania operations**
Published Jul 28, 2008
http://www.scandoil.com/moxie-bm2/financial/stock_news/stream-lists-on-tsx-venture-exchange-and-updates-a.shtml
- 14. Characterization of the Tayarat Heavy Oil Carbonate Reservoir, Kuwait**
Stonard, Mariam Al-Saeed, Mona Al-Rushaid, Sibley, Lomando, Ramirez, Haas, Jamal Al-Hamoud
ChevronTexaco Kuwait, Ahmadi, Kuwait Oil Company
http://www.searchanddiscovery.net/documents/abstracts/2005intl_paris/stonard.htm
- 15. Technology in Increasing Heavy Oil Production & Reserves**
PNZ Carbonate Steam Flood Development. – ChevronTexaco - May 1, 2006le
http://www.csis.org/media/csis/events/060501_energy_kimber.pdf
- 16. Tanganyika Oil Company Ltd. - Tishrine Block**
<http://www.tanganyikaoil.com/s/QwikReport.asp?IsPopup=Y&printVersion=now&XB0R=130110,130115,130116,130117,178172>
- 17. Technological challenges and R&D opportunities for Mexican Oil Industry**
Dr. Héber Cinco Ley - CEO Mexican Petroleum Institute
<http://www.buyusa.gov/houston/pemexotc2008.pdf>
- 18. Heavy and Extra Heavy Oil Carbonate Reservoirs in the Middle East**
John W. Buza, South&East Kuwait, Greater Burgan Studies, Kuwait Oil Company
<http://aapg.confex.com/aapg/2007int/techprogram/A112249.htm>
- 19. Schlumberger – Carbonate Reservoirs - March 2007**
http://www.slb.com/media/services/solutions/reservoir/carbonate_reservoirs.pdf
- 20. Carbonate Research "To Accelerate the Development of Alberta's Bitumen Bearing Carbonates"**
Tuesday, October 23, 2007
<http://www.ptac.org/res/rest0703.html>
- 21. The Bitumen-Bearing Paleozoic Carbonate Trend of Northern Alberta**
Exploration for Heavy Crude Oil and Natural Bitumen Environments - R. S. Harrison, 1987
<http://search.datapages.com/data/specpubs/methodo2/data/a081/a081/0001/0300/0319.htm>
<http://209.85.173.104/search?q=cache:kdBrxVFb35YJ:search.datapages.com/data/specpubs/methodo2/data/a081/a081/0001/0300/0319.htm+heavy+oil+paleozoic+carbonate&hl=en&ct=clnk&cd=3&gl=ca>
- 22. Alberta's Reserves 2004 and Supply/Demand Outlook 2005**
<http://www.eub.gov.ab.ca/bbs/products/STs/st98-2005.pdf>
- 23. Towards Economic Production of Grosmont Formation Bitumen**
Michèle Asgar-Deen - University of Calgary, Calgary, AB, Canada
<http://www.geoconvention.org/2008abstracts/169.pdf>
- 24. Oilweek Magazine - Apr 2006**
Planning for the future: Oilsands research needs to take new directions if full potential is to be reached
<http://www.oilweek.com/articles.asp?ID=261>
- 25. BlackRock Makes Heavy Oil Discovery at Chipmunk**
BlackRock Ventures Wednesday, March 02, 2005
http://www.rigzone.com/news/article.asp?a_id=20748

- 26. Strata's Technical Strategy: FAQ's**
Why has Strata focused its attention on the carbonates?
http://www.strataoil.com/techstrategy_faq.php
<http://www.strataoil.com/project.php>
- 27. Blacksteel Oil Sands**
Whitemud Project – Mississippian Heavy Oil Project Overview
http://www.capitalstreetgroup.com/yahoo_site_admin/assets/docs/Blacksteel_Presentation_June_-_08.171164358.ppt
- 28. Firesteel affiliate confirms 1.4 billion barrels of original bitumen in place on its oil sands properties**
Monday, January 28, 2008
<http://tse.db.globeinvestor.com/servlet/WireFeedRedirect?cf=GlobeInvestor/tsx/config&date=20080128&archive=cnw&slug=C4516>
- 29. Canada's Oil Sands - A World-Scale Hydrocarbon Resource**
Prepared by: R.B. (Bob) Dunbar, P. Eng. - August 2008
http://www.strategywest.com/downloads/StratWest_OilSands.pdf
- 30. An Exploratory Study - Low Carbon Futures**
Carbonate Triangle and Conventional Heavy Oil – Lowest GHG Production Scenario
<http://www.ptac.org/cho/dl/chop0701s.pdf>
- 31. Sources of Hidden Value in Canadian Oil Sands Equities**
http://www.energy.gov.ab.ca/LandAccess/pdfs/OilSands_Projects.pdf
<http://seekingalpha.com/article/49312-sources-of-hidden-value-in-canadian-oil-sands-equities>
- 32. A brief overview of the geology of heavy oil, bitumen and oil sand deposits**
2004, M. Gingras - Dept. of Earth and Atmospheric Sciences, University of Alberta
and D. Rokosh - Dept. of Physics, University of Alberta, Edmonton, Canada
http://cseg.ca/conventions/abstracts/2004/2004abstracts/122S0227-Gingras_M_heavy_oil_bitumen_oil_sands.pdf
- 33. CHOPS – Cold Heavy Oil with Sand in the Canadian Heavy Oil Industry**
14.1 Appendix 1: CANADA'S OIL SANDS AND HEAVY OIL DEPOSITS
http://www.energy.gov.ab.ca/OilSands/pdfs/RPT_Chops_app1.pdf
- 34. Mississippian Madison Heavy Oil – SW Saskatchewan**
Canadian Society of Petroleum Geologists - Rock the Foundation Convention, June 18-22, 2001
<http://www.cspg.org/conventions/abstracts/2001abstracts/C-146.pdf>
- 35. Trapping Mechanisms for Mississippian Heavy Oil Reservoirs in Southwestern Saskatchewan**
Government of Saskatchewan - 1995
<http://www.publications.gov.sk.ca/details.cfm?p=5395&cl=1>
- 36. Mississippian Paleogeography – Lloydminster Oilfield Technical Society**
<http://www.lloydminsterheavyoil.com/mississippian.htm>
<http://lloydminsterheavyoil.com/geoages.htm>
- 37. Input on “Inaccessible” Heavy Oil and Bitumen Extraction**
PTAC - February, 2006
<http://www.ptac.org/osd/dl/osdp0601a02.pdf>

- 38. Likely Beneficiaries of Heavy Oil Production Technologies**
from Seeking Alpha - December 07, 2007
<http://seekingalpha.com/article/56637-likely-beneficiaries-of-heavy-oil-production-technologies-schlumberger-imperial-oil>
- 39. Alberta Carbonates: Prime candidate for the 3rd Trillion and beyond**
Ian J. Potter PhD Vice President Energy - SPE R&D Conference San Antonio
<http://www.spe.org/spe-site/spe/spe/meetings/RDC/2007/potter2.pdf>
- 40. Direct Radiometric Dating of Hydrocarbon Deposits Using Rhenium-Osmium Isotopes**
David Selby and Robert A. Creaser
<http://www.sciencemag.org/cgi/content/abstract/308/5726/1293?ck=nck>
- 41. World Energy Council - Survey of Energy Resources 2007**
Natural Bitumen - Resource Quantities and Geographical Distribution
http://www.worldenergy.org/documents/ser2007_final_online_version_1.pdf
- 42. Enhanced Oil Recovery – An Overview by S. Thomas**
PERL Canada Ltd., Canada
<http://ogst.ifp.fr/index.php?option=article&access=standard&Itemid=129&url=/articles/ogst/pdf/2008/01/ogst07042.pdf>
- 43. How to make a million in Alberta**
Three engineers explain - Godfrey Budd
<http://www.oilsandsreview.com/articles.asp?ID=391>
- 44. Carbonate evolution**
by ArabianBusiness.com staff writer on Wednesday, 13 August 2008
<http://www.arabianbusiness.com/526652-carbonate-evolution>
- 45. Heavy Oil - Overview**
JPT (Journal of Petroleum Technology) • APRIL 2007
Steam Injection in Fractured Carbonate Reservoirs
Production of Heavy Crude Oil: Topside Experiences
- 46. Releasing the Value of Heavy Oil and Bitumen**
E. VEITH - Ivanhoe Energy Inc., Bakersfield, California, USA
<http://www.ivanhoe-energy.com/i/pdf/Paper-2006-727.pdf>
- 47. Ivanhoe Energy – Heavy Oil Upgrading Technology**
<http://www.ivanhoe-energy.com/s/HTL.asp>
HTL Video Presentation:
http://www.ivanhoe-energy.com/i/misc/cdf_96kbps3.html
- 48. Ivanhoe Energy – Corporate Profile**
<http://www.ivanhoe-energy.com/s/CorporateProfile.asp>
- 49. Nondamaging, self-diverting acid stimulations revive Egyptian oil fields**
World Oil, Feb, 2004
by Mathew Samuel, Depinder Sandhu
http://findarticles.com/p/articles/mi_m3159/is_2_225/ai_n27793314/pg_2

- 50. EOR methods for heavy-oil recovery in naturally fractured reservoirs**
Tayfun Babadagli - Sultan Qaboos University, Oman - 7 June 2002
http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDW-47GDPVH-3&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=68b90144906387133ece67d0ed15fc2e
- 51. The Physics of Steam Injection in Fractured Carbonate Reservoirs**
G.T. Shahin Jr., R. Moosa, and B. Kharusi, and G. Chilek, Shell EP Technology
<http://www.spe.org/atce/2006/technical/documents/spe1021861.pdf>
- 52. Study of Hot Water Injection into Low-Permeability Carbonate Rocks**
Energy Fuels, 2008 - Copyright © 2008 American Chemical Society
<http://pubs.acs.org/cgi-bin/abstract.cgi/enfuem/2008/22/i04/abs/ef800009r.html>
- 53. Application of SAGD to Iranian Carbonate Heavy Oil Reservoir**
Amir Kabir U of Technology, Iran, s8022949@aut.ac.ir and RASHIDI, Fariborz
http://gsa.confex.com/gsa/2006CD/finalprogram/abstract_103959.htm
- 54. Recovery of oil from oil-bearing carbonates**
United States Patent 4491512
<http://www.freepatentsonline.com/4491512.html>
http://www.osti.gov/energycitations/product.biblio.jsp?osti_id=5931900
- 55. Development of Heavy Oil Fractured Carbonate Bati Raman Field**
T. Babadagli, University of Alberta, S. Sahin, U. Kalfa, D. Celebioglu, U. Karabakal, N. N. Topguder, Turkish Petroleum Corporation (TPAO) - 2008
http://www.spe.org/atce/2008/technical/schedule/documents/spe115400_000.pdf
- 56. Temperature effects - heavy oil/water permeabilities of carbonate rocks**
BEHNAM SEDAEE SOLA, RASHIDI Fariborz; BABADAGLI Tayfun
<http://cat.inist.fr/?aModele=afficheN&cpsidt=19127447>
- 57. PDO Awards Contracts for Qarn Alam Steam Project**
Petroleum Development Oman Monday, May 14, 2007
http://www.rigzone.com/NEWS/article.asp?a_id=45145
- 58. Saudi Arabia tests potential for unlocking heavy-oil reserves**
Bhushan Bahree and Russell Gold - The Wall Street Journal - July 10, 2006
<http://www.post-gazette.com/pg/06191/704785-28.stm>
- 59. Working Document of the NPC Global Oil & Gas Study**
http://www.npc.org/Study_Topic_Papers/22-TTG-Heavy-Oil.pdf
- 60. Wettability Alteration & Imbibition in Steam Recovery from Matrix Blocks in Fractured Reservoirs**
SIYAVASH MOTEALLEH, BERT-RIK DE ZWART AND HANS BRUINING
DIETZ LABORATORY, CENTRE OF TECHNICAL GEOSCIENCE
<http://209.85.173.104/search?q=cache:V4dycgtqPwQJ:www.geo.citg.tudelft.nl/~bruining/Oilwetv6.doc+heavy+oil+from+carbonates&hl=en&ct=clnk&cd=42&gl=ca>
http://www.geo.citg.tudelft.nl/~bruining/Oilwetv6.doc#_Ref94515431
- 61. Technology in Increasing Heavy Oil Production & Reserves**
PNZ Carbonate Steam Flood Development. – ChevronTexaco - May 1, 2006
http://www.csis.org/media/csis/events/060501_energy_kimber.pdf

- 62. SINOPEC Northeast Company**
http://english.sinopec.com/about_sinopec/subsidiaries/oilfields/20080326/3030.shtml
- 63. Mexico's northern region launches massive development**
http://findarticles.com/p/articles/mi_m3159/is_11_222/ai_80326155
- 64. High prices and growing demand put global focus on unconventional oil plays**
Oilsands Review – March 2008-08-28
<http://www.oilsandsreview.com/articles.asp?ID=535>
- 65. Extracting Heavy Oil: Using Toe to Heel Air Injection (THAI)**
Posted by Gail the Actuary on August 27, 2007 - The Oil Drum: Canada
<http://www.theoil drum.com/node/2907>
http://www.heavyoilinfo.com/feature_items/technology_improves_in-situ.pdf/download
- 66. Transformation of Heavy Oil and Organic Matter from Carbonate Reservoirs in Hydrothermal Processes**
Kayukova, Nigmedzyanova, Romanov, Lazarev, Dakhnova, Khramova, and Nazarova
Arbuzov Institute of Chemistry, Kazan Research Center, Russian Academy of Sciences
http://www.maik.ru/abstract/petrchem/5/petrchem4_5p228abs.htm
- 67. Expanding Heavy Oil and Bitumen Resources while Mitigating GHG Emissions and Increasing Sustainability**
<http://www.ptac.org/osd/dl/osdp0601c02.pdf>