
VERN CARL LARSON

INTERVIEW 2 OF 2

Date and place of birth (if available): High River, Alberta

Date and place of interview: 5815 Elbow Drive, SW, Calgary, Alberta (Mr. Larson's Residence)

Name of interviewer: Peter McKenzie-Brown

Name of videographer: Peter Tombrowski

Full names (spelled out) of all others present:

Consent form signed: Yes

Transcript reviewed by subject:

Interview Duration:

Initials of Interviewer: PMB

Last name of subject: LARSON

PMB: I'm meeting with Vern Larson and we're meeting at his house at 5815 Elbow Drive, SW, in Calgary and my two areas of interest for this interview, the second interview, are the Cold Lake story and advances in research methodology. So we're going to begin with the Cold Lake story. Vern, can you give me just a summary of how the Cold Lake story began, last time we talked, you mentioned a well in 1964, you said didn't produce any oil but it led to several research projects over a 20 year period.

LARSON: What I said before was that the well didn't produce very much oil, and they have produced five barrels a day, but that was definitely not enough oil to consider that that particular venture was successful, however, that particular venture, first of all, involved the injection of steam and the assumption was that steam would be able to invade the formation and get far enough away from the wellbore to heat a substantial amount of oil and then when you stopped steam injection, the oil would flow back along with some of the condensate as the steam cooled. That turned out now to happen, and nevertheless, Don Wilson decided to continue to increase the injection pressure until he got the pressure up to a point where the steam did invade the formation and it invaded it by fracturing the formation by the well known process that we know today as hydraulic fracturing. And so it turned out that well then did produce, I believe, around 70 barrels a day, and at that time, we didn't know how or why the well was behaving in that most wonderful way. So following that



Sponsors of The Oil Sands Oral History Project include the Alberta Historical Resources Foundation, Athabasca Oil Sands Corp., Canadian Natural Resources Limited, Canadian Oil Sands Limited, Connacher Oil and Gas Limited, Imperial Oil Limited, MEG Energy Corp., Nexen Inc., Suncor Energy and Syncrude Canada.

experiment, we drilled another 14 wells and I'm basing this information mostly on information that is in Tom Boberg book.

PMB: Tom B-O-G-A-R-D's?

LARSON: Yes, only it's B-O-B-E-R-G.

PMB: B-O-B-E-R-G?

LARSON: Yeah. And we drilled 14 wells on a subdivision, a section, subdivision 9 of section 22, and these 14 wells were very close together, relatively speaking, approximately two acre spacing and we steam stimulated those wells and found out that they were far too close together to be able to have another project. And these wells were too close together for there to be an economic project, so the next pilot project was called Ethel, named after a lake in that area.

PMB: E-T-H-Y-L?

LARSON: E-T-H-E-L.

PMB: E-T-H-E-L.

LARSON: And it was in 15 of 22, it comprised nine wells and they were on about five acre spacing and that turned out to be fairly successful, and that project was started in 1964 and the other day when I was looking for some more information on Lulu, on a Cold Lake Project, I discovered that we apparently issued a patent, or Imperial Oil got a patent in 1966 on, it was called at that time, the article didn't have the real title of the patent, they called it cyclic steam stimulation, well I mentioned cyclic steam stimulation in my previous interview that cycle steam stimulation had discovered accidentally by Shell in Venezuela, but this is a different kind of cyclic steam stimulation, because in Venezuela they don't have to fracture the formation in order to get the steam to come into it, so I daresay the distinguishing feature of this patent relates to the use of high pressure steam that's high enough to fracture the formation.

Anyway a certain amount of success was observed from the Ethel Pilot, then we went on to the main pilot which was 23 wells with 5 acre spacing and following that, that started, I guess, sometime around 1972, and following that we had another pilot of 56 wells, on with more than a quarter acre spacing and those 56 wells, they weren't all drilled at the same time, but of time, that project was producing 60,000 barrels a day in 1984 and the average production rate was 53 barrels a day. So altogether, in that particular area of Cold Lake, which I mentioned, the land was obtained many, many years ago. At that time, Imperial acquired 190,000 acres in the Cold Lake area and in order retain those acres you had to drill evaluation wells and over that period of years, ten years or more, fifteen, they'd drilled 100 evaluation wells and we also drilled 190 pilot project wells and after having done that, the time came when they thought that they were in position to start what has been called mega-projects and so I'll stop at that point in the history, in that part of the history.



Sponsors of The Oil Sands Oral History Project include the Alberta Historical Resources Foundation, Athabasca Oil Sands Corp., Canadian Natural Resources Limited, Canadian Oil Sands Limited, Connacher Oil and Gas Limited, Imperial Oil Limited, MEG Energy Corp., Nexen Inc., Suncor Energy and Syncrude Canada.

PMB: Okay, that's a really comprehensive summary of the story, thank you very much. Now I'd like to talk about the Cold Lake Mega Project a little bit. How big was it meant to be? How would it have worked? There was going to be an upgrader if I recall, and do you have any idea how much it was supposed to cost? I thought it was in the billion dollar range.

LARSON: I have some answers to those questions, it was expected to produce, I have seen it in something I've read recently, 125,000 barrels a day, it was to produce, it was to have an upgrader. The only cost information I can suggest is that when Syncrude's Project, I had some information from the internet that it cost around \$2.5 billion dollars. Well, let me start again, it didn't cost \$1.5 billion dollars to produce 65,000 barrels a day, so we can, and that included an upgrader, so we can assume that if the Mega Project, so-called, was going to produce 125,000 barrels a day it would cost perhaps twice that, maybe \$3 billion dollars, maybe a little more because it was a little later and the prices were a little higher, so that project of course, did not go ahead, but that was in general approximately what the project involved.

PMB: So the project would have included little pads and cyclic steam production wells and they would have all funnelled into an upgrader which would then ship the upgraded oil to market somewhere.

LARSON: That's correct. And the cyclic steam stimulation wells, as we had learned, had a life of about eight years, and so you have to be continuously drilling new wells, if you're going to maintain the production at a certain level, so you're always drilling new wells and your abandoning older wells.

PMB: Okay, at the beginning, just before we started this particular recording, you mentioned to me that you made a couple of errors in respect to the horizontal wells, would you mind repeating that, because I don't think we have it on record.

LARSON: Well I will, I believe I've put those corrections in the corrections to the transcript that you gave me, but the first horizontal well was drilled in Cold Lake. The second horizontal well was drilled at Norman Wells and there was a third horizontal well drilled in Cold Lake a bit later.

PMB: Okay, fair enough. I'd like to talk to about the National Energy Program. Somebody mentioned to me the other day, his name is Al Hyndman and he's very knowledgeable about the oil sands, his argument was that the Alberta Government cancelled the Cold Lake Mega Project almost to spite to Federal Government during the political battles associated with the National Energy Program, do you agree with that assessment?

LARSON: No.

PMB: Does that make sense to you?

LARSON: No, I don't agree with that at all. I'm not saying that the Alberta Government could not have cancelled it, but I can tell you that the reason, as far as my concern, the project didn't go ahead



Sponsors of The Oil Sands Oral History Project include the Alberta Historical Resources Foundation, Athabasca Oil Sands Corp., Canadian Natural Resources Limited, Canadian Oil Sands Limited, Connacher Oil and Gas Limited, Imperial Oil Limited, MEG Energy Corp., Nexen Inc., Suncor Energy and Syncrude Canada.

was because the National Energy Program didn't leave us with enough money to be able to finance it, so it was strictly a matter of not having the ability to build the project, as far as I'm concerned.

PMB: What would some of the impacts have been? Didn't the NEP kind of, didn't encourage Canadian production, or, did it put extra taxes on the in situ bitumen, or what were the economic measures for that? Or, on a larger scale, did it just cut into Esso's ability to fund this project?

LARSON: Well I'll suggest some things that I think were the reason or reasons, first of all, Premier Lougheed increased, Premier Lougheed abrogated agreements that Alberta landholders had with the Province that offered them a royalties, that cost them to pay or allowed them to pay only 12.5% royalty to the Alberta Government.

PMB: Yeah, this was around 1971 or '72, am I right?

LARSON: I have no idea when that happened. That made a very significant difference, because his, the royalty rate that he was charging was up to, in the 25%-30% as I recall. Now the Federal Government, previously, made that 12.5% royalty non-deductible, excuse me, made that 12.5% royalty deductible for corporate/federal income tax. And although industry kept trying to get the government to change that, the Federal Government didn't ever change it.

PMB: Now that happened, if I'm not mistaken, around 1974. So that was one of your responses.

LARSON: That could be, however, that certainly reduced the amount of money available to a person to invest in new projects, so I believe that was one reason. I recall, I do recall the National Energy Program also wanting the "Canadianization" of projects, and I can only have that word put in quotation marks because I don't remember exactly what it meant. But I suspect it would have meant that Imperial Oil would not be allowed to build that project itself and operate it, and that would have to be in association with somebody else who had several billion dollars. And whether that somebody else was looked for, couldn't be found, or what the problem was, but those kind of problems, whatever they were, they certainly caused Imperial to decide not to go ahead with this so-called "Mega Project".

PMB: And then of course, what Imperial did agree to do, or did decide to do finally, was to develop the Cold Lake Project as a staged series of developments. Stage one in '81 or something and Stage Two a bit later, can you give us a little bit of that story please?

LARSON: That then became the plan, to develop in stages, that involved a project it would produce to 10,000 to 12,000 barrels a day and that project was able to finance itself and produce a cash flow that would help finance the second project and I don't know what, I would assume that under the Alberta provisions, or the Alberta Royalty system for those projects, whatever it was, it allowed that to happen. And I don't know whether the National Energy Program had died by that time, or whether or how it might have effected that program, all I know is that that program went ahead and ultimately that project ended up producing a 120,000 barrels a day after approximately 12 phases, I



Sponsors of The Oil Sands Oral History Project include the Alberta Historical Resources Foundation, Athabasca Oil Sands Corp., Canadian Natural Resources Limited, Canadian Oil Sands Limited, Connacher Oil and Gas Limited, Imperial Oil Limited, MEG Energy Corp., Nexen Inc., Suncor Energy and Syncrude Canada.

read. And of course, it's been expanded since then and today it's now producing significantly more than that.

PMB: Good. Okay, well that brings us up to date and that's a really nice concise summary of the Cold Lake story, thank you very much. Okay, now I want to move to an area which I think is, it might even a little closer to your heart and this is the advances in research methodology that occurred during the period you were involved. Would begin by telling me a little bit about your involvement in oil and gas production, you were a reservoir engineer, I believe at the beginning and you were, in one form or another, involved in oil and gas production and development for quite a number of years, how many years was that?

LARSON: I don't like to say that I was involved in oil and gas production, as a reservoir engineer, I worked in a very narrow area of reservoir engineering and you do that at your desk and in those days, in the early days, we used an electronic analogue computer, which was a device of considerable size, filled half a room, and we had the only one in Canada, there were two that I know of in the United States.

PMB: What years are we talking about here?

LARSON: Well that machine existed in, it was built about 1950 and I went to Tulsa, Oklahoma and learned to run one there, and one was being built in Tulsa for Imperial Oil and it was moved to Calgary and it was used for many years and it was used to study reservoirs that had a water drive and the purpose of the analogue computer was to handle the water influx into the reservoir and also handle the expansibility in the reservoir as the reservoir pressure decreased from its original reservoir pressure and started to develop gas in solution. So that electronic analogue computer did that work for many years, however, it did become possible to make the same calculation on digital computers and when that happened, that's probably about 1974, '75 or maybe a little earlier, we used to get on our plan and go to Toronto where IBM had its scientific computer, at that time it was called the IBM 704 and we would reservoir engineering problems on that. Nowadays, petroleum engineering students learn to use such a computer program, on a desktop computer and that reservoir engineer will have a desktop computer on his desk, that can handle calculations that we used to have to go to Toronto to do, so the computer in terms of reservoir engineering, has made a very significant advance in that area of study. Then I no longer was involved in reservoir engineering, then I got involved in things like corporate planning, when I got transferred to Toronto, but in due course, the Department of New Energy Resources was formed and that's when I started getting involved again in the heavy oil business, particularly in Cold Lake.

PMB: And that was in the mid to late 70's?

LARSON: Yes that's right.

PMB: Okay now, the real focus of this last part of our interview, I would like you to help me to understand your commentary about the analogue computer was fantastic, for example, I wouldn't have imagined that. But, my question is this, and in just general terms and then please be more



Sponsors of The Oil Sands Oral History Project include the Alberta Historical Resources Foundation, Athabasca Oil Sands Corp., Canadian Natural Resources Limited, Canadian Oil Sands Limited, Connacher Oil and Gas Limited, Imperial Oil Limited, MEG Energy Corp., Nexen Inc., Suncor Energy and Syncrude Canada.

specific, how much change have you seen in oil and gas research during the period that you were involved in that and let's arbitrarily pick the year 1975 and from there to the time you left, so about 11 years?

LARSON: Well, I believe, changes in research were spawned by the desire of people who were producing oil and gas to solve some of the problems they had, so if they had a problem and if their engineers were really too busy to work on that problem, or wanted somebody else to see if they had some new ideas, they would come to this group, it was called Imperial Oil Research Group. Other organizations had similar research group, Shell had one, and I believe it's still operational, Petro-Canada had one but they shut theirs down a few years ago as they didn't...Imperial Oil shut down most of its production research except for heavy oil a few years ago too.

PMB: Gulf had one in the late 70's as well, didn't it?

LARSON: I don't remember if Gulf did, where it was, they may have? They certainly had a group in the United States. A very major group, in fact, Gulf really invented reservoir engineering.

PMB: Can you say a little bit about that please?

LARSON: Well they had a man who was last name, whose name was Morris Muskat.

PMB: M-U-S...

LARSON: K-A-T.

PMB: M-U-S-K-A-T. Morris Muskat.

LARSON: And he has a book about a, a very famous book, we all used to use it, it was, if I may use the term "The Bible" of reservoir engineers and probably still is, he was a brilliant man. And Gulf, to their credit, made that technology available to the whole industry in the form of this book that Muskat wrote.

PMB: And roughly what year was that? Is it 50's?

LARSON: No he would have invented, started that, probably in the late 30's.

PMB: Oh wow.

LARSON: I can probably find you my volume of that book and we could look up the copyright, but that's not convenient to do that right now.

PMB: Okay, please continue, that was a very interesting aside. You were talking about the desire to make these changes, the need to make these changes...I'm sorry, continue your train of thought, the changes in research and development.



Sponsors of The Oil Sands Oral History Project include the Alberta Historical Resources Foundation, Athabasca Oil Sands Corp., Canadian Natural Resources Limited, Canadian Oil Sands Limited, Connacher Oil and Gas Limited, Imperial Oil Limited, MEG Energy Corp., Nexen Inc., Suncor Energy and Syncrude Canada.

LARSON: Well I was going to say that generally speaking, industry does do basic research, they do mission oriented research, so they solve problems that they either believe that industry is going to have, such as Roger Bulter and his work on steam-assisted gravity drainage, the problem was how to better produce heavy oil and he thought of a better way, but other problems people would bring to you, is how can we find out whether these fractures at Cold Lake are vertical or horizontal?

As it turned out, we find out that they were largely vertical and that they ran in a southeast to northwest direction and that meant that we should change the orientation of wells in our production operations to make the direction parallel to the fracture, that the distance between wells greater in the direction parallel to the fracture than it was in the direction perpendicular to the fracture, so that's an example of research that was problem oriented. But, so what tools changed? Depending on the inventiveness of the people that you have working for you, certainly there were physical tools that changed, lobbying tools, electric logs became different as time went on and more complicated, that world became more complicated, of course that was another field of research done by a group of different people but, and I find it a little hard to...

PMB: Was that a group of people at Esso?

LARSON: No, no. The people who do well logging research were people like Schlunberger, down in Houston, because they were the people that offered that as a service company. But there was a major, there was one major production change that was developed, to my knowledge, by Amoco, which also I think were called Pan American Production and they invented fracturing of wells in the process of completing a well and until Pembina was fractured we used to call Pembina, the biggest non-commercial oil field in the world, because it covered a great number of acres and the wells wouldn't produce very much, however if you fractured them, they produced great quantities of oil, I'm not going to say great, maybe a 100 barrel a day, maybe 200 I don't know. So that was a major discovery that certainly was first practiced in the United States and then was practiced in Canada by Amoco who described that field in Pembina, and of course, its widely used today, still used today, especially when producing the natural gas from the shale zones, but that's extremely recent.

PMB: Now as I recall Pembina was discovered around 1953 or '54, so did they develop fracturing around then?

LARSON: Yes.

PMB: Really?

LARSON: Yeah. That field would never have been produced, I don't believe, without fracturing.

PMB: The tools that you used, in my notes I mentioned things like the tools to measuring emissions, effluents and that kind of thing, it seems to me, this from an earlier interview I had, that one of the really amazing changes that has happened over the last 50 years is our ability to handle data and a lot of this was computers, but a lot more of it were tools that had much more, that could give you much more sensitive readings. Did that play a role in the work you did?



Sponsors of The Oil Sands Oral History Project include the Alberta Historical Resources Foundation, Athabasca Oil Sands Corp., Canadian Natural Resources Limited, Canadian Oil Sands Limited, Connacher Oil and Gas Limited, Imperial Oil Limited, MEG Energy Corp., Nexen Inc., Suncor Energy and Syncrude Canada.

LARSON: Well laboratory tools improved, I guess the one I can think of I've had that was really important was the gas chromatography, so we had a section in our laboratory, first of all gas that didn't, gas chromatography, it involved the analysis of oil and the analysis of natural gas but it was also instrumental in analyzing something that was very important to the geological people called, they call them source rocks, because geologists always wondered where did the oil and gas, where did it come from, how did it come?

PMB: So what is this source?

LARSON: That's exactly the question, what is the source, they always had the feeling there was something called a source rock somewhere, down in the earth and that was the source of the petroleum and the natural gas and so the rocks were crushed and analyzed to see if they could find a substance in these rocks that was the precursor to petroleum or natural gas, and they did find source rocks that were rocks that they called source rocks, that they had found material in them and this material was analyzed by means of, in some cases, another technique called liquid chromatography and the reason this was important is that source rocks in a certain area of Alberta were found to be in a area called gas-prone, meaning if you're going to drill an exploration well, chances are you're going to discover gas instead of oil.

And, so it was very important to differentiate between gas-prone areas oil-prone areas; and the gas-prone areas tended to be those areas that were in a part of the earth that was heated more than oil-prone areas, and over billions of years, that material ended being turned into natural gas. So this kind of theory was believed to be a worthwhile following up and so had people in a laboratory making these studies using the sophisticated analysis instruments, they were turning over, turning their data over to another group of people called geo-chemists who were a very specialized kind of geologist, and the geo-chemists and the geologists would get together and try and figure out what was the meaning of this. The technology I've just described in terms of finding oil and gas, I know very little about, I only know that we had quite a bit to do with getting the basic data that was used by the geologists and the people that wanted that information.

PMB: Vern, based on the last ideas that you had on this, you're most recent understanding and I'm sure it's not termed, the source of the oil sands, the sources rocks for the oil sands, one of the ideas that I've heard, and I don't know if this true or not, one of the theories out there, is that the reason

these huge deposits of oil, part of the reason these huge deposits of oil developed in order to become bitumen is that it might have been shifted to the east as the Rocky Mountains rose, did you know anything about that idea, or do you have another theory of how those enormous deposits might have developed?

LARSON: It's probably still a mystery, but the only thing I recall, I do not recall hearing anything about the development of the Rocky Mountains being involved in the process, however, it is my understanding that the Athabasca oil sands, in the bitumen in the Athabasca oil sands came from petroleum that at one time was far lighter in gravity and it, unfortunately, wherever that petroleum



Sponsors of The Oil Sands Oral History Project include the Alberta Historical Resources Foundation, Athabasca Oil Sands Corp., Canadian Natural Resources Limited, Canadian Oil Sands Limited, Connacher Oil and Gas Limited, Imperial Oil Limited, MEG Energy Corp., Nexen Inc., Suncor Energy and Syncrude Canada.

was developed it migrated, it did not have a cap rock, and so it migrated from some depth to areas close to the surface where other processes took place. The only one I can think of is oxidation.

PMB: Bacterial.

LARSON: It could have been bacterial degradation, certainly. But I don't really know. Lots of people have ideas about that and are more knowledgeable than I am.

PMB: Okay, now, I want to go some of the softer parts, I don't call them softer, the less business focused things that began to happen, I believe they became most, they began to develop a momentum starting in the late 70's and it has continued from then until now, and these are things like safety, there was the environment and also, of course, the efficient use of employees' money, shareholder's money which has always been a concern. So first of all, did you see, in your years, major changes in policies and procedures related to employee safety, and if you did, what were they?

LARSON: Well, I lived in an environment, in a company that was always safety conscious and I can't remember when the company didn't have, in field operations, people concerned about safety and drilling operations, people concerned about safety at that time, office in Calgary, which is the one I'm most familiar with, there were two people whose job involved in safety and then they went to various regions and then they came to our department, so that's about the only relationship with safety that I can think of, except that within my own department we had a room that was called the medical, kind of like medical room, I can't exactly reiterate what that term was, but anyway, it was a room that had all sorts of, it had resuscitation equipment, it had bandages for preparing fingers, if they had a cut finger and that sort of thing.

We had one person that was regarded as the first aid person; however, lots of people had first aid training. Also, in terms of safety and a little unrelated to this, is the Calgary Fire Department, they would come and visit us two or three times a year, unannounced, they were welcomed, we would welcome them to come whenever they wanted to and they'd look around and see if they saw anything that they thought they should tell us about, they wanted to know where we kept, if we kept large quantities of any volatile chemicals like toluene, and we told them where it was, showed them where it was and we got their advice and that sort of thing and in the time that I worked in the laboratory, I don't know, which was years before I got transferred to Toronto and also when, and it was my responsibility when I was transferred back again, I don't remember having a lost time accident in that whole time, I can't remember, well other than knowing that there were weekly safety meetings, I can't remember how that was managed to tell you truth, except that it was in that safety record, as certainly very good and that certainly stands out in my mind.

PMB: Okay, thank you very much. Environment, the environmental, in my notes, I called it an environmental awakening and I kind of remember it beginning to develop in the 1970's sort of in the public consciousness, but now of course, it has become a very important part of our lives for all of us. What's your experience on the industrial side, especially the oil sands?



Sponsors of The Oil Sands Oral History Project include the Alberta Historical Resources Foundation, Athabasca Oil Sands Corp., Canadian Natural Resources Limited, Canadian Oil Sands Limited, Connacher Oil and Gas Limited, Imperial Oil Limited, MEG Energy Corp., Nexen Inc., Suncor Energy and Syncrude Canada.

LARSON: All I know about the oil sands and the environment is what I read in the newspapers and I think we've already discussed that probably in the last interview, you know, I didn't have anything to do with that part of the business, we did have things to do with some environmental activities as far as our laboratory was concerned and one of them, was in oil spill research. Now remember at the time I left, when I retired from the company it was 1986, people were far less concerned about the environment than they are today and I don't remember people worrying about any of the disposal ponds in the Athabasca area, but at that time we were doing research in off-shore, we anticipated drilling wells in the Beaufort Sea and we said what would happen if we had an oil spill on ice, how do you clean that up and so that was one facet, one feature that we spent time.

Another one was oil spills on water, or on lakes, and we had one gentleman who was responsible for advising operations people and he went out with operations people when they had an oil spill, he was, I would have to say (a) company expert in that, he was familiar with the chemicals of dispersants, he carried out dispersal tests from the laboratory, we own an infrared camera that he would use and he even put it in an helicopter from time-to-time and flew over regions because you could tell, you could detect features of an oil spill with infrared light that you couldn't detect very easily with visible light, so that was the main part of the environmental activity at the laboratory, but those were the early days of the environmental concerns.

PMB: Okay, thank you. As an energy company, you use energy to produce energy and of course, to maximize profits you need to use as little energy as possible, this is what we would say today was that an obvious concern for you in your work, in the Cold Lake area.

LARSON: Well, if the use of energy I think you, you mentioned earlier that as far as the shareholder is concerned, the shareholder wants a maximum return on the shareholder's investment, so that means that we look for ways to reduce costs, but the most efficient way to recover oil, the most inefficient way of recovering oil is to try and displace it with water and that's called water flooding. But we still use water flooding. Now we could do something else called gasoline flooding, because gasoline is miscible with the oil, but gasoline is very expensive, in fact, it's more expensive than the oil is, so a more efficient way to get oil out of the ground is to displace it with gasoline instead of water but efficiency isn't the answer, the cost is the answer, so we're looking for the most cost-effective way consistent with whatever the environmental regulations are or, I suppose consistent with the whatever the political climate is.

Sometimes those are a conflict. I daresay, if we as individuals were concerned about efficiency, energy use, using energy efficiently, we'd be driving diesel automobiles, not many of us do because they're somewhat more expensive. The same thing is going to be true with the electric cars; they're more expensive, are they going to be a good seller? Well that remains to be seen, but the cheapest way, probably the best way to do it, even using natural gas in an automobile is possible, but it's rather more expensive partly because it's hard to, it's costly and difficult to transport very much natural gas in a car unless you liquefy and that's an even more expensive process and then hard to do and take side-pressure tanks and so on. So efficiency is, or conservation of energy, is probably a thing they try



Sponsors of The Oil Sands Oral History Project include the Alberta Historical Resources Foundation, Athabasca Oil Sands Corp., Canadian Natural Resources Limited, Canadian Oil Sands Limited, Connacher Oil and Gas Limited, Imperial Oil Limited, MEG Energy Corp., Nexen Inc., Suncor Energy and Syncrude Canada.

to do consistent with the cost of conserving it and the restrictions that are imposed by government or by the public.

PMB: Thank you, last question, during your years at Imperial, what was the most surprising development in your part of the business, or what were the most surprising developments in your part of the business? Astound me please.

LARSON: I can't astound you, I can only tell you that injecting high pressure steam at Cold Lake, that was astounding and that well produced 70 barrels a day and we didn't know why, but also hydraulic fracturing is a marvellous process too and that certainly changed the industry greatly and the other one we've talked a lot about, of course, is steam-assisted gravity drainage, which as far as the Athabasca oil sands, deeper Athabasca oil sands are concerned, it's going to make that possible, but even that even that isn't working in every location, because at least one project is having a few problems getting the amount of oil production that they had hoped to get from it and that's probably because of my lack of continuous vertical permeability, but that's just a guess, that's a reservoir engineer's guess, but those are the three things that I can think of off-hand.

PMB: Now earlier on you gave me a number of documents, would you mind reading into the transcript again please. There are for your file Glenbow archives.

LARSON: Well one of them, the first one is United States patent, one of Roger Butler's patents, he had three patents, and I only have two of them. This one is called recovery of hydrocarbons by in situ thermal extraction; the next one is called method for oil recovery using a horizontal well with indirect heating, that's the second patent. I can't tell you what the title of the third patent but it was, these were all issued about, these two were issued in 1978 and I believe the third one was issued at that time too.

PMB: Let me ask you a question on that, so Roger Butler owned these patents?

LARSON: No, no.

PMB: Okay so they were his patents but Imperial owned them?

LARSON: The inventor is Roger Moore Butler, Calgary, Canada. Assignee: Exxon Production Research Company, Houston, Texas.

PMB: Thank you.

LARSON: For which Roger would have received the grand sum of \$450.00.

PMB: Boy, he must have felt pretty rich.

LARSON: The next document is six pages from, its entitled: Full Description of Innovation, and these six pages contain the description of the concept of steam-assisted gravity drainage and they



Sponsors of The Oil Sands Oral History Project include the Alberta Historical Resources Foundation, Athabasca Oil Sands Corp., Canadian Natural Resources Limited, Canadian Oil Sands Limited, Connacher Oil and Gas Limited, Imperial Oil Limited, MEG Energy Corp., Nexen Inc., Suncor Energy and Syncrude Canada.

were used in a submission to the Manning Awards Committee that I and another chap made sometime in 1992, hoping that Roger would win the \$100,000 Manning Award for a significant innovation, unfortunately it was awarded to somebody else.

PMB: That Manning award was named after Ernest Manning, the former Premier of Alberta, is that correct?

LARSON: That's correct, Ernest C. Manning, as a matter of fact. The next document is a letter in support of the application for Roger's nomination, I mentioned Dr. Butler worked for Imperial Oil and some of the significant developments he made in regard, and this was with respect to steam-assisted gravity drainage. The third is a recommendation from Clem Bowman, or his first name is Clement, C-L-E-M-E-N-T, and Clem at one time was the manager of AOSTRA and I asked him...

PMB: He was the Chairman wasn't he?

LARSON: He was the Chairman, yeah, that's correct, and I asked Clem if he would agree to write a recommendation for Roger, which he very happily agreed to do. Now another document relates to the first one is called, Esso Resources Horizontal Hole Project at Cold Lake, it was given at a meeting in Banff in 1979, and it mentions, it talks about the first horizontal well that Imperial Oil drilled. The second document dated about 1987, was again a technical paper presented at a technical conference. It mentions the second horizontal well that Imperial drilled was drilled in the Norman Wells area in the Northwest Territories, and then it describes this second horizontal well that was drilled, as a Cold Lake horizontal well, it was the second horizontal well drilled at Cold Lake.

PMB: Great, thank you very much. Vern this has been a tremendous opportunity to talk to you and share your knowledge, thank you.

[END OF RECORDING]



Sponsors of The Oil Sands Oral History Project include the Alberta Historical Resources Foundation, Athabasca Oil Sands Corp., Canadian Natural Resources Limited, Canadian Oil Sands Limited, Connacher Oil and Gas Limited, Imperial Oil Limited, MEG Energy Corp., Nexen Inc., Suncor Energy and Syncrude Canada.