



## K. C. YEUNG

Date and place of birth (if available): 1949; City of Guangzhou in China

Date and place of interview: July 16, 2013

Name of interviewer: Peter McKenzie-Brown

Name of videographer: Peter Tombrowski

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Consent form signed: Yes

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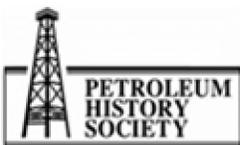
Last name of subject: YEUNG

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PMB: Today is the 16th of July, 2013. I am talking to K.C. Yeung and he is a technical guy as he will explain with Brion Energy. So, now we can begin. K.C. I would like to start by asking you just to tell me briefly about your background. Where were you born? Where did you go to school? What was your technical expertise and so on? Just begin there, please.

YEUNG: Sure, yeah. I was born in China in the City of Guangzhou in 1949. It used to be called Canton, but now the Chinese Government wanted to change everything to the Chinese way. But, in my old passport it was saying Canton. But, now it is has changed to Guangzhou. Shortly after I was born, that was when the communists took over China. So, my father took me to Hong Kong. So, I grew up in Hong Kong and took my elementary school, high school, matriculation. Then, I went to university in the United States; the University of Hawaii in Honolulu.

So, I finished my bachelor and master's degree in mechanical engineering, specializing in heat transfer and fluid mechanics. Mechanical engineering people would think about mechanics, machines. But, actually they have a certain speciality in heat transfer and fluid mechanics. So, I was doing geothermal research at the time. That was when the energy crisis and people thought that they may be able to utilize the geothermal energy because Hawaii has the volcano. So, there should be some sort of -- When I graduated and finished my undergrad there was lots of research funding on



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the geothermal energy. So, my master's thesis is in the geothermal reservoirs heating. So, after I finished my master's degree I immigrated to Canada.

PMB: Now, before you leave that, have they been successful in Hawaii to develop geothermal energy?

YEUNG: As far as I know, no. Not during my days and I have not heard anything. During my days, because we were involved in more of the theoretical and the civil engineering people were trying to look for the water table and whether there was hot water, but they were not able to find it at that time. But, I have not followed it since. But, when I went back a couple of times, I have not seen any big scale geothermal energy which they are using in New Zealand or Japan.

PMB: Okay. Sorry, continue. Now, you are leaving university?

YEUNG: Right. So, leaving university at that time I had two choices: either I continue my education. I got accepted by the University of California in Berkley for a PhD program. Or, I could come to Canada as an immigrant. So, I decided to immigrate first and then maybe take my PhD later on, which I never did. So, I immigrated to Canada on July 1st, Canada Day 1976. At that time, I did not know that was Canada Day, I just came in on that day. Then, living in Vancouver for two, three months and I looked for jobs but they didn't need any engineers in Vancouver, B.C. They needed experienced people, so I moved to Edmonton and stayed in a classmates place. My classmate was working as an electrician actually for Syncrude; they were building Syncrude at that time. So, I stayed in his place for a few months and then I got a job offer from Texaco Exploration Canada.

So, I moved to Calgary. I think it was probably January of 1977, around that time. I can't remember whether I came just after Christmas or after New Year, I forgot. So, I reported to Texaco Exploration Canada. And, I was hired by the research manager at that time. So, I thought that was working in the research, they call it the RTD, Research Technology Department. But, the first day I went to work they say, "Oh, by the way we just have the reservoir engineer who just quit. Maybe, you work in that department and it's the tar sands department."

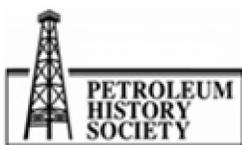
PMB: Oh, really. So, right back in 1977 you were in the oil sands?

YEUNG: Yeah. I started...

PMB: Did they call it the tar sands in those days?

YEUNG: Yeah. Nowadays, we try not use the "tar sands", but at that time Texaco being a US company. At that time, they called it the Tar Sands Department and Texaco have a steam flood project in Fort McMurray south of the airport. So, they need the reservoir engineer to analyze and monitor the performance. So, my career started with the heavy oil in the oil sands.

PMB: Now, that was during the period when AOSTRA was active and was basically subsidizing oil sands experimentation, wasn't it?



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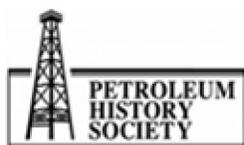
YEUNG: Right. So, it was probably about the same time. I don't know when exactly AOSTRA started. But, that project has been going on for a while, but that project is I think 100% Sun Oil. No, sorry, Texaco, which is an American company, so it's a subsidiary of Texaco Inc. in the United States. So, there are people coming up to Canada every two to three times a year and then we have to present a performance to them. I still keep in touch with one of the technical people from 1977. He just retired from Chevron, I guess, last year. I met him last year when I was in Houston. He was still working at that time.

So, Texaco they have these steam flood projects, so I stayed there for about two years and I got an offer for Sun Oil. Sun Oil was just establishing their heavy oil department. Because, they have the GCOS which stands for the Great Canadian Oil Sands which is doing the mining, the oil sands mining, but they still want to do the in-situ thing. They have lands in the Athabasca area, but they also have land in the Cold Lake area. But, in those days there is no technology especially for the Athabasca type which is very, very heavy. You are talking about viscosity of over a million centipoises; so, high viscosity. At that time, it was deemed to be easier to work on the Cold Lake stuff and Imperial Oil/Esso Resources were doing a pilot and it was fairly successful. So, the heavy oil department was set up to look at all the properties or even acquiring properties so they can develop right away. The Athabasca stuff may take longer.

So, shortly after I joined Sun Oil they found this heavy oil department. When I joined them I was a reservoir engineer and they have a division, they called it division reservoir engineer/division mechanical engineer. But, there is no heavy oil department. So, in the Cold Lake are the oil viscosity is lower. So, it is supposed to be easier to extract or you get more production out as compared to the Athabasca type of formation. So, actually at that time, they were also planning to farm in a small project from a company called, Canadian Worldwide.

So, Canadian Worldwide has a group of wells and they were doing the cyclic-steam stimulation or the CSS and they were going to expand it. But, they didn't have the money. So, Suncor would come in and put in a whole bunch of money and get 50% of the working interest. So, when I joined them they were in the planning. So, shortly after I joined they actually went in and bought that 50% and that is when they formed the heavy oil department. And, strictly working on that project and expanded by drilling a hundred more wells, but at the same time also looking for lands or properties close by that area. Even though Suncor still had a whole bunch of land in Firebag now; actually in Firebag we have two leases: one is called Firebag, the other is called Muskeg. Now, they are both known as the Firebag project. We also have another big chunk of land called, Cheecham.

So, those are the three big oil sands leases up in the Fort McMurray area. And, in the Cold Lake area we didn't have that much, so we have a small lease just north of the Cold Lake. I think they may have sold it to Olsen now. So, by getting this steam project, we had got into production and we learned from it. So, in the meantime we had a small group of geologists that scout from the Lloydminster area to the Lindberg, to the Cold Lake area and see whether we can get additional land which is good for this CSS process, because CSS is deemed to be the only one that is more successful. That is what Imperial Oil is using now in the Cold Lake commercial project. So, at the



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end we found this piece of land, actually Dome Petroleum was trying to sell the rights within the Primrose Weapons Range. They have ten townships north of Imperial Oil's Cold Lake area. And, actually they got the rights from AEC, Alberta Energy Company, because inside the Primrose Range, all the mineral rights belong to the Alberta Government. So, they assigned this to the AEC.

PMB: Ten townships is 360 square miles? Is that correct?

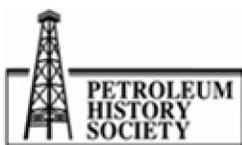
YEUNG: Yeah, right. One township is 36 sections. One section is one square mile. So, that's right. So, Dome has to get the rights to earn. AEC still holds the ownership, but Dome one time I did not know how much they paid AEC to get it, but during so many core holes and wells and they have the rights to earn. But, even the right to earn is worth money. So, it was a crown company at that time. So, Suncor paid Dome a certain amount of money. I forgot exactly how much, I think it is probably close to \$79 million for almost a township of land and maybe even bigger. The oil sands rights and also the P&NG rights. So, that's the right to earn, but we haven't earned yet. So, only when we start-up build the facilities for 5,000 barrels per day, then we will earn. So, Dome has not earned it, but the right to earn Suncor had to pay them \$79 million for these rights and then we have to spend extra money in order to earn.

So, remember we had to present this case to the CEO. At that time, Suncor's head office is in Toronto, Yonge Street somewhere. At that time, they changed it from Sun Oil to Suncor and so they were three divisions: one was the oil sands, which was originally the GCOS, Great Canadian Oil Sands; one is based in Calgary which is the exploration and production for the conventional oil and gas and also the in-situ, not the mining part of the oil sands. The third part is the refinery and the marketing and the gas stations down east. So, Suncor has the refinery in Sarnia, Ontario and of course, on the east side we have the Sunoco gas stations. So, those are the three main divisions of Suncor. But, the head office is in Toronto and probably close to the parent company in Philadelphia. So, I remember that we had to fly there. I was the supervisor of reservoir engineering and then we have two more technical people: the supervisor of mechanical engineering and also the supervisor of geology.

So, we went there and presented the technical case and then there was the manager of -- There are people who are involved in the planning, they would present the economics. And, of course, then you have the VPs, the directors and we all went to Toronto in the evening and I still remember that was Halloween night. So, Halloween night on Yonge Street is very interesting. And, then the next morning we presented the stuff and then after that, our technical people get out and then leave the senior management and they would mull over the economics; whether they should put in a bid to Dome. Should we get all ten townships or should we get a small parcel.

PMB: At this time, were you considered an executive or were you still a technical person?

YEUNG: I am always a technical person, yeah. I reported to the manager of heavy oil and he reported to the VP and then the VP reported to the executive VP who head's up all the Calgary and then there is another executive VP who handles the oil sands; the mining, the extraction and the



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upgrading. And, then another executive VP handles the refinery and the marketing stuff. So, in the morning we presented the technical stuff and then we were out. So, we were flying back to Calgary in the evening and then the VPs would stay behind for the weekend and go over it. So, at the end Suncor put in a bid and they get only the crown jewel of the whole ten townships. We didn't want to get all the ten townships.

PMB: So, you just took one, what you thought was a key township?

YEUNG: Right. Then, the AEC they try and get -- I think Dome was part of the heavy oil went to Amoco. So, Amoco has some of the others which they later on developed.

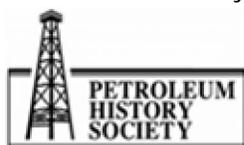
PMB: Question for you: this would have been about the time that Dome was really struggling with debt?

YEUNG: Right, just from 1985 or so; 1985 - 1986.

PMB: I'm well ahead of myself, then?

YEUNG: Yeah, yeah. That is when we got that piece of land, yeah. Well, after you spend \$79 million, you want to develop as soon as possible. So, Suncor very soon came up with this 1,000 cubic metre per day project, go the ERCB approval to do the CSS and we had to build a road because there is no all-season road. So, we had to build a road from Imperial Oil's existing road to the plan site and to get the water. Now, water was a big issue even in those days. This Imperial Oil was taking the water from Cold Lake and also from the ground water, from the aquifer. And, local people or some of them were not very happy. I remember I attended some of the so-called Community Advisory Council, the CAC meeting in the Cold Lake Grande Centre area. So, every two months they have this local meeting and they invited all the industry people, ERCB, Alberta Environment. And, quite often they would complain or sometimes say Imperial Oil has done a poor job and they are getting all the water. And, sometimes the wells get dry because the cattle are farming there.

So, for Suncor to come in with proposed projects, we have to be careful. But, before when Suncor operated the small project that I mentioned a while ago, from this Canadian Worldwide when we drill we have to drill these extra 100 wells. We needed to get water from somewhere. But, Suncor at that time was very innovative. We got the water from the Town of Bonnyville which is not too far away from that Fort Kent. So, we build a pipeline from the Bonnyville sewage lagoon. That means when people flush the toilet there, so the water goes to this social aquifer where they would be treating. Actually, they are fairly clean in terms of water generation. They do not contain lots of harm. So, we build this pipeline and use it. Otherwise, from this lagoon they call it the slough. And, use that water or part of the water from steam generation. So, the local people were quite happy and they supported this. So, they try and do the Burnt Lake which is quite a larger project. We have to find another way, but then we cannot use the sewage from the Grande Centre Cold Lake's town, because they are quite far away. What Suncor did at that time was to build a pipeline from the Cold Lake Fish Hatchery, because well after the fish hatchery raised the fish from the fishling little eggs



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and then with the fish they are quite dirty, right. And, then it would go back to the lake. But, before it goes back to the lake, Suncor would use a small percentage; maybe 10% of it. It should be good enough for our project for a long time. So, we built a pipeline from the fish hatchery to our site. They spent about \$25 million total to build a road and a fish hatchery. And, of course this belongs to the Fish and Wildlife Department, because Fish and Wildlife would take some of the fish when they grow to a certain size, maybe 10 centimetres or so and they would stock it into the lakes around Alberta and Northern Alberta. Calgary also has a fish hatchery in Inglewood. So, they stock the fish and that's why we have to pay to buy the fishing licence. So, that people can catch the fish in those lakes. So, Suncor spent \$25 million on the road and then the pipeline and then the oil price dropped. So, we had to shut down.

PMB: In 1986, wasn't it that it just...

YEUNG: Yes. It was probably 1986, 1987; around that time.

PMB: It really went through a rapid quick decline, yeah.

YEUNG: Right. So, we had to justify the economics of the project. So, what we did is to look at the design. Instead of 100 cubic metres per day, 1,000 metre cubic metres per day, we changed it to be 2,000 cubic metres per day. But, then your costs would not be two times. I don't know exactly, maybe 30% more or so by changing the pipe size. So, after the change because of the economy of scale, it looks more economical. And, then the oil price come up a little bit, so we went ahead and got the ERCB's approval of the amendment and the amendment from 1,000 to 2,000 cubic metres per day. So, we went ahead and then drilled the wells. We started to drill the wells. All the wells are drilled from a drilling pad. So, instead of doing all the vertical wells, in those days we drilled the wells at an angle. So, by the time we get to the reservoir it will be several hundred metres away.

PMB: So, you had a single pad and then you'd make drill half a dozen wells from....

YEUNG: Yeah. Actually, we drilled 25 wells.

PMB: 25 wells from a single pad?

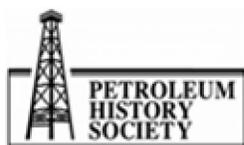
YEUNG: Right.

PMB: What was the length of these wells?

YEUNG: The reservoir is around 400 metres or so; 400 or 500 metres or so; vertical depths. So, when you go in there may be close to 1,000 metres.

PMB: This was before horizontal drilling?

YEUNG: Yes, it was before horizontal drilling. Imperial Oil they are the pioneer, but they started with the vertical and they start to deviate. While Suncor, we wanted to go further out. So, if we go



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further out then we have to start with an angle, we cut in a slant. So, Suncor used kind of a slant to build the first start-up rig. And, then when you do the well over then you need it on surface. So, you know that for the wells to go farther away, Imperial Oil day they have 20 wells per pad. At Suncor, we have 25 wells per pad. So, most of the wells are at an angle when it start spudding. Of course, there are some close vertical too. So, we drilled/finished one pad, 25 wells. The other pad, we finished 19 wells I think and then the oil price dropped again. And, this time there was no end in sight. And, in our operation at Fort Kent which was still operating, every barrel that we produced we lost money; we lost a few dollars.

So, the decision is to stop drilling, bring the rig back and recall the people back to Calgary, because we have a few people assigned to the project. And, I think a couple of people are even building houses in Bonnyville and I think one person was building in near the Moose Lake, which is west of Bonnyville, very nice area. People have a cabin or something like that; so, big fun property. But, we cancel all this getting all the people back to Calgary. Laid off a whole bunch and also transferred the other to the conventional oil department.

PMB: Did you just shut down production entirely?

YEUNG: No production, just the drilling, because we hadn't started producing yet. Later on, the Fort Kent project start producing for a while, but then later on we also shut it down. We were losing money on it. So, there are the two, kind of false starts at Burnt Lake. But, then we still haven't earned the land yet. We just got the right to earn. So, then we tried a different way. At that time, south of Cold Lake in the Lindberg area, Irish Creek area, people started to use those screw pumps or PCP, Progressive Cavity Pumps. And, when they produced the oil they also produced the sand with it.

PMB: Those pumps actually go back that far, to the late 80s?

YEUNG: Right. So, late 80s or early 90s and 1990 I think that is when we started to think about, "Well, maybe we should try using these screw pumps." Even though our oil is a little bit too viscous, because in Cold Lake, Imperial Oil's viscosity is 100,000 centipoises, but I think our oil would be a little bit lighter. But, we drilled the wells already, so it doesn't cost that much to try out. So, went to some of the more vertical wells, perforated; so that means making holes in the pipe. And, then start pumping and then some wells they started to come pretty good. And, then we put in some wells, some more. The first four wells, they did very, very well and they produced every 20 cubic metre per day without putting in any steam.

Now, in the south side Imperial Oil is doing the steam project, but I think even with steam the average for the production is around 12 cubic metres per day. So, without putting in any steam, we were producing every day. So, we were very happy. But, in the interim we found out that as we tried to put in more wells under production, we found that this good grade only happened in a certain number of wells, probably close to the top of the structure where we have higher gas saturation. Further down the dip, instead of 20 cubic per day, only 10, 5 cubic per day and then half a mile



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away, almost nothing. Also, some of the wells that the cap rock is not very competent after doing some well over. So, we found that this water coming down from the formation above, because the cement bond was broken when we did the well over. It affected some of the other wells which did not experience this cap rock integrity problem. So, in the end we didn't think that this is a commercial process; it only worked for a few wells. So, we gave up this so-called CHOPS Process, Cold Heavy Oil Production with Sands. Now, they are still doing this in the Lloydminster area, but Cold Lake area which nobody thought it would work. It did work then because of the cap rock problem, because of the gas saturation problem you need a certain amount of gas in order for it to work. So, we gave up the CHOPs at the Burnt Lake. So, what is next? We still haven't earned yet.

PMB: Now, you were earning from Dome?

YEUNG: From AEC.

PMB: Oh, from AEC, okay. But, Dome...

YEUNG: Dome is out.

PMB: Dome is out. I had been acquired by Amoco?

YEUNG: By Amoco, right.

PMB: I think it was \$8 billion which seemed like a huge amount of money at the time.

YEUNG: Yeah. But, then the AEC later on changed the overriding royalties on that property interest thing to working interest. I forgot whether we were doing the CHOPS or whether we were doing the SAGD. Now, because of the failure of CHOPS we decided to look -- that is the time AOSTRA's UTF project, Underground Test Facility project had success using the SAGD process, the Steam-Assisted Gravity Drainage. So, that's when Suncor decided to look at that.

PMB: Now, let me just put this in context. So, that was in 1987?

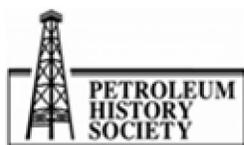
YEUNG: No. The SAGD is in the mid-90s.

PMB: Sorry, I'm talking about the UTF, the Underground Test Facility was constructed and began its tests in 1987, I think

YEUNG: No, 1985-1987 they just have the conceptual study. Production will be later than that.

PMB: Okay, I'm sorry. Would you just continue and tell us your experience with the Underground Test Facility.

YEUNG: So, I was in UTF's industry committee, so AOSTRA proposed this to the industry and then we went up to Fort McMurray. At that time, they'd already drilled the shaft and then they



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planned to do the tunnel. So, we went up to look at the big platform where a whole bunch of drill bits showed us the shaft. So, they presented the case and they run some simulation. But, at the end we all said, "It's too risky to participate." And, we don't know for sure if it works and we have to put in several million dollars each from the company. I don't know exactly...

PMB: So, Suncor did participate in the experimentation in that or not?

YEUNG: Not yet. So, we didn't join until a later date. So, I think nobody else joined at that time. So, AOSTRA went ahead and then do the Phase A which is only 15 metres long, three well pairs 50 or 60 metres long. And, they found out it really worked. Then, they went to the Phase B which is 500 metres long, horizontal well drilled from a tunnel up to the oil sands. And, then that's when with the success, other companies started to join. And, still not Suncor yet. We joined after the failure of this CHOPS at Burnt Lake. We need to find another process. And, we said, "Wow, why don't we do it." At that time, nobody had done it in the Cold Lake area. They just did it in the McMurray area. So, it's a different formation. So, somehow maybe we should take a look at it. So, that's when we decided to participate. Of course, then we had to negotiate with AOSTRA and the partners.

PMB: Couple of things: you keep referring to Burnt Lake?

YEUNG: Burnt Lake; that is the land that we acquired the rights to earn from Dome.

PMB: In order to become part of the AOSTRA tests and I think that the experiments by the different groups of people began around 1989 or 1990, didn't they?

YEUNG: Yeah...

PMB: Each company, I think there were 17 that participated. Each company had to contribute a few million dollars to the project.

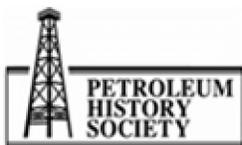
YEUNG: Right.

PMB: Do you remember what the numbers were and how the experiments went on that?

YEUNG: No, because Suncor joined later in probably 1995 or 1997.

PMB: Oh, really.

YEUNG: Yeah. But, at that time Mobile wanted to get out; Mobile Oil wanted to get out. Of course, they didn't want to keep on paying for that. They didn't think that they would fit into this strategy. So, we negotiated with Mobile to take over the future payment. Now, what about the previous payment? Okay, usually they have an agreement that for new companies to come in they have to pay back what was paid before, what is fair and also there may be a penalty. But, AOSTRA at that time, really liked Suncor to participate, because if anybody in the area who would bring it to



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commercial, Suncor has the advantage because there is an upgrader there. They don't have to worry too much about the height, heavy/light differential. So, they would really like Suncor to come in. So, in the end for whatever reason, there was agreement by the partners that Suncor did not have to pay for the original payment for the first years and also any penalty. We may bring in some technology or "in-kind" technology or something like that. But, I know that we didn't put in any cash.

PMB: This would have been around 1997?

YEUNG: Yeah.

PMB: At this time, what was your job at Suncor or Sun Oil?

YEUNG: Yeah, Sun Oil.

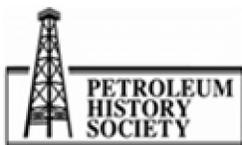
PMB: Or, Suncor, sorry.

YEUNG: I was supervisor of reservoir engineering in the heavy oil department. We have another supervisor of reservoir engineering for the conventional side. So, we got to participate and then learn about it and then I initiated a safety pilot at Burnt Lake. We drilled three well pairs and then it was pretty successful, it operated for a few years and then the company decided to focus in the Athabasca area. So, we sold it to CNRL.

PMB: Now, that was the time in 1997/1998 when oil prices pretty much hit rock bottom, didn't they?

YEUNG: Yeah. But, then they started to go up. I think we sold in two-thousand and something. It was pretty successful. There were some breaches near the end that we were able to operate successful and we learned quite a few lessons. It's in the Clearwater formation which is what Imperial Oil is doing. So, the reservoir quality is not as good as in the Athabasca area. The Clearwater formation, the oil saturation is a bit lower and also the main thing is the permeability. The permeability is the indication of how easy for any fluid to flow. So, even though the viscosity, the oil is a little bit lighter in the Cold Lake, but once it's heated it up it doesn't matter. It's easy to flow anyway, whether it's in Athabasca or it's in Cold Lake. The main thing is that how easy for any oil to flow through. It can flow a lot faster. So, Athabasca, the McMurray formation has that advantage. So, in the end Suncor decided to sell to Burnt Lake and then focus in what we call the Firebag land.

So, remember I mentioned that Suncor had two pieces of land up north, Firebag and Muskeg. Actually, Suncor surrendered the Muskeg lease back to the Crown. Because, at one time we thought, "Oh, we don't need that much land." One lease is about two townships which is 72 square miles. It's good enough for development. And, we tried to sell the Muskeg which is south of Firebag and nobody bit. So, we surrendered to the Crown. But, later on when this SAGD seems to be the next big wave, Suncor went back and bought the land back and then acquired some more. But, those there we know that there is oil in there and Suncor decided to go to the land sale and go further east.



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There is not enough exploration from this side. So, I think Suncor now has bought 11 townships of land.

PMB: At this time, Rick George was the CEO of Suncor?

YEUNG: Yeah, right.

PMB: Can you talk at all about your impressions of the difference that his management style made with the company?

YEUNG: Yeah, well I think he brought in his aspect and could see quite well. But, then the company changes, I guess, depending on the economic situation in those days, depending on the technology. So, he felt that while we have the technology to go in and then also, expand. And, we of course get the consultant to do a study and look at where should we concentrate and where we should focus. The study said, "Well, you should go into the Firebag area." And, that's where we acquired a lot more land, because the production that we can go through the pipeline to upgrader or you can go to the Black Oil Market, but also to the upgrader. So, you have the option. You can go to upgrader, the differential is high and then we can upgrade it ourselves.

PMB: The upgrader of course is in the old GCOS plant?

YEUNG: Yes, GCOS. And, then they were planning to expand that with the Millennium Project.

PMB: The Millennium Project was an expansion, not only of the upgrader, but also of production?

YEUNG: Also the mine too.

PMB: Oh, the mine, but also the SAGD.

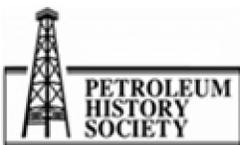
YEUNG: Right.

PMB: So, there were a bunch of things that were all changing together.

YEUNG: Right. So, we concentrated on the Firebag area. Now, I mentioned that we did have another piece of land which is in the south side of the airport. Firebag is on the northwest or even on the east side of the mine, about 20-40 kilometres east of the upgrader. But, then there is another piece of land, maybe around two townships we call it the Cheecham.

PMB: Is that an aboriginal name?

YEUNG: There is also a town called Cheecham and probably an aboriginal one. But, even before the SAGD was in its infancy and Suncor had to drill a few more core holes in order to keep the land. So, Suncor said, "No, we don't want to spend much money there." So, there was another company that said, "Yeah, I will drill the wells for you." Not a lot. I do not know how much money



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we spent; maybe a million, a couple of million dollars. But, with that then Suncor would keep the land and they would earn 50% of the land. That company is called OPTI Canada. The parent company is in Israel and I guess they have the technology of combining the upgrading with a SAGD project. So, they came in and they earned 50% and then shortly after they proposed to become a commercial project. So, Suncor decided not to participate in this commercial project. We wanted to concentrate on Firebag. So, we sold the other 50% to OPTI. So, OPTI owned 100% of the Cheecham property and they proposed this project called Long Lake Project. And, then they got Nexen to come in and participate at 50% of the Long Lake. But, that property used to belong to Suncor.

PMB: Now, what is the story of that Cheecham property, because it seems to me that OPTI was a stock market darling for a while and then terrible things happened and I don't remember whether it went bust or what?

YEUNG: My understanding is that they start a pilot there and the pilot wasn't doing that good. There was maybe some flaw in the design, in the reservoir design and they found that is very close to some water zone. So, the performance is not what they expected. And, even right now when they went to the commercial project, their performance is still one of the poorer SAGD projects. Also, the facility design in theory it is good because they can combine the upgrading with the SAGD part. The thing is that there is too much integration, so if one thing does not perform well, it will affect the others. It is supposed to generate its own gas; you don't have to buy gas, natural gas from outside. But, if something is wrong on one side, it affects the other side. So, for the first few years it didn't do too well. Now, that they can use gas they can have the option of taking gas from the outside.

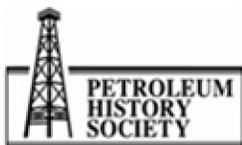
PMB: Right now, gas is quite cheap compared to five years ago.

YEUNG: Right. So, in the end I guess OPTI got into trouble, so they sold their interests. Actually, Nexen instead of 50% I think got a bigger chunk. So, OPTI kept a smaller chunk and then OPTI sold their chunk to CNOOC, the China National Offshore Oil Corporation. So, CNOOC first bought OPTI's share but then now everybody knows they bought the whole Nexen company; not just for their project, but the whole company. But, it's interesting, not too many people know that that land used to belong to Suncor. Actually, I was quite disappointed when Suncor decided to give up that property. If we do it right, it would still work.

PMB: Now, where are we in this grand story?

YEUNG: So, that's how Suncor got into this big in-situ and Firebag is probably one of the biggest SAGD producers in-situ over 100,000 barrels per day. So, I was involved in the initial design. I did initial production forecast for the SAGD wells.

PMB: Now, at this time. So, we're still kind of in the 90s and early 2000s. You've got a transformation that's going on at the GCOS plant and it's basically being transformed I think,



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mostly with trucks and shovels and with the two train upgrader and so on. Do you have any comments on that?

YEUNG: I'm not very much involved in the mining and extraction part; although, we did go up there and looked at the mine and looked at just the formation. We talked to the geologists there. At that time also, I was too involved in the reserve evaluation, so we talked to the geologists and see what they thought about the reserves and how we do the reserves. But, otherwise I don't go up to the plant at all, even when they started operations. I only went up there maybe two or three times, when they were just beginning. And, then I worked on some of those special projects. So, I changed my title to supervisor of special studies. I looked after the reserve and also, some other interesting things. But, not involving the day to day operations and look at some of the water disposal issues. I was also looking at using the monitor, the heaving of the ground. Because, when you do the SAGD you inject steam underground, you increase the temperature and pressure, so the ground moves up and we can monitor it.

PMB: There have actually been some explosions in which the steam just blew through the earth.

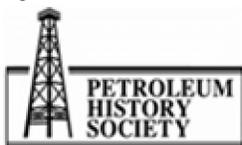
YEUNG: That happened at Total's Joslyn project. But, you are careful but now ERCB is now very careful. You cannot operate over a certain maximum pressure and the you have to do a few tests to justify that pressure, to make that you will not fracture the reservoir or fracture the cap rock. Otherwise, the steam would come up beyond, especially when many reservoirs are very shallow near the Fort McMurray area. In the Cold Lake area, it's a lot deeper. But, in the Fort McMurray area it is shallower. Like, Suncor's Firebag project, Shell, Husky Sunrise project is quite shallow. So, if you're not careful...

PMB: Because, it's quite shallow and therefore, because it's so shallow...

YEUNG: In Total it's often even shallower. We're talking about 100 metres or so of overburden; 100 metres all over. So, I put in some heave monuments to measure. So, each year when the ground is frozen, they send a surveyor to measure and see whether that part has gone up or not. Then, I also install some corner refractors. They are using this new technology called, INSAR and it is using the satellite to capture the image. So, we have the reflector and it has to be a certain angle depending on which satellite you want to use. The satellite goes to a certain trajectory around the earth. So, they have to be a certain angle so we can capture the image. So, every 20 something days, we capture an image and compare to the image before. And, then there is a calculation and algorithm to calculate whether it has gone up or gone down. So, it's very set. And, now a few companies have installed that to look at whether the surface has a...

PMB: There is also micro-seismic. Do you use that at all?

YEUNG: Not at the Firebag. Not Firebag, no. There are some companies that use it. But, they still use the heaving with the satellite thing. I think after I left I guess, they haven't used it at all. The refractors are there, but they just don't acquire the data. But, I heard that they are trying to go back again and take a look at it.



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PMB: They have become very complacent.

YEUNG: Yeah.

PMB: When did you actually leave Suncor and what more do you want to tell me about those operations?

YEUNG: When I was there we call it the Stage 1 for the Firebag, so we drilled 20 well pairs. Then we also packed 101, 102 and then we finished drilling 103. But, the performance was not as good as what we anticipated. And, that is because the water, well actually it's a two-edge sword. Because, the formation is so good that it's very permeable. So, when you inject the steam, the steam has lots of places to go. But, also the reservoir pressure is quite low too. So, when we inject the pressure, then the steam just go away. So, later we have to drop the pressure, drop the operating pressure. The steam wants to go from one place, from high to low. If the pressure is too low, then the steam would go away quite far away. So, even when the oil is seeping up it would not be able to flow.

PMB: It won't touch the lowest levels.

YEUNG: Right. So, they determined to drop the pressure and we don't have enough steam for the 20 wells. So, we operate only about 11 wells. So, for a while we struggled a little bit and later on they put in more steam capacity and started to expand. The production is very good, because you can produce more than 2,000 barrels per day. What we did not anticipate at that time is that we have to put in a lot more steam to produce the 2,000. So, the steam/oil ratio is a little bit high, higher than what we would like to see. And, then I left after a few years.

PMB: What year did you leave?

YEUNG: I left in 2008.

PMB: Well, in 2008 actually there was a financial crisis.

YEUNG: Just before.

PMB: Just before that oil hit \$150.00.

YEUNG: At that time, nobody would have expected that and so Husky gave me an offer that I could not refuse. I was recruited by Mr. John Lau the president and CEO of Husky, because Husky had some problems with the Tucker project which was very underperforming.

PMB: Let's put that into a perspective here. So, you left Suncor and you went to Husky Oil?

YEUNG: Right.

PMB: Husky Oil is owned out of Hong Kong if I'm not mistaken?



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YEUNG: Yeah, Li Ka-Shing. Li is the last name. We call it the family name for China.

PMB: It's called the surname isn't it?

YEUNG: Yeah, they call it the surname. Surname is the family name. Chinese in Hong Kong they put in the surname first, family name first. So, I was hired by Mr. Lau to help him to reveal the Tucker project mainly, to see why it's wrong. It had kind of an improper design. They drilled the wells a little bit too low where the oil saturation is not too high and they did not have a good start-up process design. For SAGD you usually have to warm up both the injector and the producer and usually you will circulate steam inside the wells for about three months. And, Husky did not do it and I guess they made some wrong assumptions in the simulation. And, they thought they were able to do it. So, with both placements of the wells and then also the wrong design, so the performance has been poor. When I joined them, they were producing around 3,000 barrels per day. The design capacity was supposed to be 30,000 barrels per day. And, when I left about a year ago, they were producing close to 10,000 by drilling more wells because they have to put wells in higher where you get a better oil saturation.

PMB: The technology was SAGD?

YEUNG: The technology was SAGD.

PMB: Are they still aiming at 30,000 barrels a day?

YEUNG: No. With the current facilities, they will not be able to get to 30,000. I think 10,000, 12,000 will be the limit. The steam/oil ratio would be high because of the low oil saturation in the reservoir.

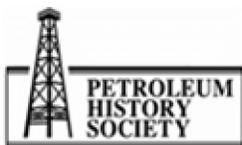
PMB: Now, what are the issues around oil prices? Currently, the international price for Brent Oil is \$100.00 a barrel. Canada is taking a pretty big discount because of the of the pipeline problems. How are the economics of oil sands production right now?

YEUNG: For the projects that have already been built, you can still operate for a long time. Let's say we're getting the oil that we get after the differential, transportation it must be \$40.00, \$50.00 a barrel.

PMB: The transportation differential.

YEUNG: Yeah. But, even let's say \$30.00, \$40.00 or \$50.00 a barrel. I looked at the last oil sands review and it's in the range of \$50.00 a barrel. So, some months it would be lower. But, your operating costs are around \$20.00 a barrel, right. So, you're making \$30.00.

PMB: So, there's still a big bucket.



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YEUNG: You may not start a new project, because you need to recover the capital. If you want to justify building a new project, you need to have a high oil price and low operating cost. But, once a project is built, your cost is sunk. So, we must keep on operating and they get a whole bunch of cash flow. But, to just find new projects could be difficult, because the cost of building a new plant, the capital cost is getting higher and higher. But, once it's built even though Tucker, the steam/oil ratio is not very good, but there is still generally lots of cash flow for Husky.

PMB: You left Husky how many years ago? Two years ago?

YEUNG: About a year ago. I left in May.

PMB: You joined a company which is called Brion Energy?

YEUNG: It was called Dover Operating Corp at that time.

PMB: Dover Operating Corp and it changed its name because there is a company of a similar name in the United States.

YEUNG: Yes. There were some legal challenges.

PMB: So, you are now Brion Energy. Can you please tell me about your present operations?

YEUNG: This Dover Operating Corp was formed in the year 2010 when Petro-China bought in 60% of Athabasca Oil Sands project. One is called the McKay River project. The other is called Dover project. So, it can be confusing because the Dover Operating Corp owns the Dover project. But, anyway so Petro-China bought 60% of the projects only and there is no production.

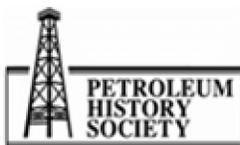
PMB: Who did they buy them from?

YEUNG: Athabasca Oil Sands which has changed its name to Athabasca Oil now. But, at that time it was only oil sands, now Athabasca also has some conventional production; so, just the project and they need a company to operate it. So, they formed this Dover Operating Corp for this joint venture. Athabasca Oil Sands says that their own people are doing 100% of the project. So, they formed this company and of course, Petro-China has the majority of 60%. Now, my understanding is that when they negotiated this deal, they also have some options. So, as soon as the project was approved by the ERCB then the Petro-China can have a call option in the Athabasca. They put an option so that Petro-China can get the 40% of the project from Athabasca.

PMB: So, Petro-China has a call option, is that what you're saying?

YEUNG: Right.

PMB: So, in effect in a call option I would call you up and I would say, "I'm ready to take the rest of it."



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YEUNG: Right. And, the price is already negotiated. So, McKay River project was approved by the ERCB in December of 2011. So, I think they have 30 days to exercise that option and then they did. So, I think it's in January of 2012 and Petro-China owns 100% of the McKay River project. Now, the other project Dover commercial project is still under review by the ERCB. We just had a hearing in late-April, early May. So, I think that it's 90 days or so for ERCB to make their decision. So, if the decision if it is approved, then they will probably be options and the feeling is that they may exercise the option. So, by that time Petro-China may own 100% of the Dover project. So, in that case Athabasca would be out. So, Brion Energy could be 100% owned by Petro-China.

PMB: Okay, now we talked about this a little bit earlier on about earlier this year or late last year, Nexen was bought out by a Chinese company.

YEUNG: Yeah, the Chinese Offshore.

PMB: Chinese Offshore, CNOOC; Chinese National Overseas Oil Corporation, I think it is called.

YEUNG: Offshore.

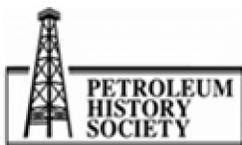
PMB: There was a lot of concern and worry about this basically because the question was, "What's going to China going to do? Take a substantial amount of cash and come and buy up all of Canada's resources. Then what happens?" As you explained to me earlier, this is quite a different case.

YEUNG: Right. CNOOC was buying an old company which was already producing lots of oil. So, of course the oil, you can send it to whoever wants it. Now, even you want to send to China, there is no transportation to send it China. Whatever makes sense? If China pays you more money than you send it to China rather than other countries, but right now you don't have a port. You don't have a pipeline to the West Coast. So, you cannot send it China anyway.

PMB: That won't happen until the Northern Gateway Pipeline issue is resolved?

YEUNG: Yeah. But, CNOOC is buying the whole company Nexen which already has their own people doing all the work. So, there could be some concern that well after CNOOC takes over, would they off some of the people so we lose the jobs. Would they cut the spending? Nexen has a certain strategy. Each year they put in so much money to do certain things. So, would China change this strategy? But, for Brion Energy it is quite different, because there is no production. And, Petro-China would just find the property and then they still have to invest in the construction, drilling the wells, put in facilities which are billions of dollars before you can have production.

So, first they have to pay to get the land, the projects and then they have to put in money to build the projects to drill the wells. And, then they have to hire people. It starts from scratch, the company when it's first formed it is probably only 20 something people. Some were secondees from Petro-China, some secondees from Athabasca, but since then they are hiring people which is just a Dover employee which are now Brion employees, they are not secondees. Myself, I am Brion employee. I am not a secondee from either Athabasca or Petro-China. So, the people were bringing in their own



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employees, because when it is formed there is no expertise. So, Athabasca has to send people, technical people to do the jobs to apply to the ERCB and still dealing with the ERCB and Alberta Environment and also with the First Nations, the other stakeholders. So, we're expanding. When I joined the company, it is about less than 200 people than a year and a half ago; year and two months ago. Now, we have about 250 people and we are expected to have probably 400 people by sometime next year, the end of 2014.

PMB: So, that would be 18 months from now you expect to have 400 people.

YEUNG: That's why we have to move from the office. Our office used to be in Bow Valley Square and we just moved into the old Encana Place a few months ago; I think it was back in February/March that we moved. And, we have from the 3rd floor to the 11th floor of what used to be called the Pan-Canadian Building and then they changed it to Encana Place. It is still probably called Encana Place on 9th Avenue. So, but in a few years we expect that we may have to move again because there will not be enough room with our expansion.

PMB: That's amazing.

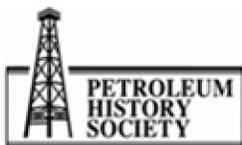
YEUNG: Yeah. So, Petro-China has continued to put in money. Hire more people and then put in money to build the facilities to drill the wells.

PMB: We're virtually done with the interview, but just a couple of quick questions. In terms of your company's business forecasts, what is the thinking about getting pipeline capacity built? There is a greater and greater expansion.

YEUNG: Right now, Brion Energy is just focusing on the two projects. Now, Petro-China on the other hand, they may have some other opinions. You may have heard that Petro-China also bought 50% of Encana's Duvernay property. That is the tight gas. I think they are also involved in some L&G terminal in the West Coast, but that is Petro-China. So, in the end how do they manage that business or would it be part of Brion, we do not know.

PMB: So, Brion if it were to combine some of these operations into a single company it could become quite a large player?

YEUNG: Right. So, almost like an integrated company. Petro-China also got together with Trans-Canada to build a pipeline from our project to south, I think to Edmonton or somewhere connected to that. Otherwise, we do not have a pipeline to take our oil to the market. So, I think that's the plan. But, I don't think it is Brion Energy, it is the Petro-China. But, who knows what they have planned. Right now, Brion is just concentrating on the operations of the two projects and that is why the CEO hired me and said, "Here, can you help me and make sure that everything is according to the best engineering practice?" Because, of my experience in heavy oil and also in SAGD, the UTF and I did the two projects in Suncor: Burnt Lake and also, the Firebag. And, then also at Husky's Tucker project and I was involved in the Sunrise project. And, then I have my connections with the industry. I know quite a few people who have left.



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PMB: Sorry, please remind me about this. I had forgotten about this completely: the Sunrise project?

YEUNG: Sunrise is Husky's big 60,000 barrels per day SAGD project. It's the first phase. But, it's right next to Suncor's Firebag, it is west of Suncor's Firebag project.

PMB: So, you were involved in this Sunrise project?

YEUNG: Right, because I was the manager of oil sands technology. So, I John Lau asked me for my opinion, I guess, because Tucker is not doing so well. So, what happened to Sunrise and because we do not have a very good reputation on the oil sands, but Sunrise is a completely different reservoir. But, then if they learn the mistakes at Tucker Lake, but that doesn't mean that Sunrise will be similar. It is more tolerant, because the oil saturation is better, the permeability is better.

PMB: I want to ask you a couple of other things. You've been very active in a variety of industry associations. For example, the Petroleum Science Society of CIM which is now part of the society of Professional Engineers, you were technical conference for the Professional Engineers Heavy Oil Conference last year and you were heavily active with the Canadian Heavy Oil Association according to your resume which I have in my hand. Would you like to talk about your involvement in those things?

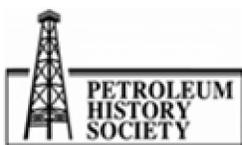
YEUNG: I think the oil industry or the heavy oil sands can be quite good and I want to give back. And, also because I feel that I want to do some mentoring and bring back; so contribution. That is why I initially I was involved in the technical committee of some of the conferences. I know quite a few people, so at conferences we have invited speakers to talk. Then, later on the Canadian Heavy Oil Association asked me, because they were trying to have a joint conference with CSPG, the Canadian Society of Petroleum Geologists and so the president of CHOA at the time, "Would you come and work as the director of special events for the CHOA and look after this joint conference and some other things." So, I joined as the director of special events.

PMB: Did you actually work for the CHOA?

YEUNG: It's volunteer.

PMB: Oh, it's a volunteer job.

YEUNG: So, we just meet once a month on the board. But, then for this conference we would meet every two weeks, I guess, before the conference started. So, the conference was a success. I was also involved in the other committees too. There is a conference called, Slugging It Out; a very successful conference and used to be a joined conference between Petroleum Science Society of CIM and the Canadian Heavy Oil Association. So, I was involved in the committee. So, two years at the Canadian Heavy Oil Association they asked me, "Well, we'd like you to be the vice president which will be the president the year afterwards." So, I asked them, "What about the people on the board with longer history?" But, they say, "No. Even though you are not on the board for a long time, but your



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reputation, your seniority in the industry, you are the best person." So, okay I became the vice president and then the year after I became the president of CHOA.

PMB: What year were you the president?

YEUNG: 2005/2006, because the annual general meeting is around June, sometime around that time. So, it was 2005/2006. And, then I was also involved in the conference organized by the Petroleum Science Society of CIM. Now, CIM is the Canadian Institute of Mining, Metallurgy and Petroleum; it's the whole Canadian wide. Petroleum Society is just one of the organizations within the CIM. Now, later on we kind of separated from the CIM, because most of the organizations are mining people. They don't understand upstream much. So, there is not a lot of synergy there. In the meantime, there is also the SPE, Society of Petroleum Engineers based in Richardson, US and they also are coming into Canada. But, we are more similar to SPE than with the SIM.

PMB: Sorry. So, the Petroleum Society of CIM does not exist anymore?

YEUNG: No, not anymore.

PMB: Now, it is what?

YEUNG: Now, it is SPE Canada.

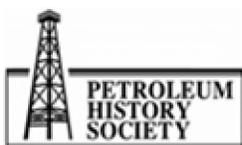
PMB: Oh, so you're just SPE, Society of Professional or Petroleum Engineers?

YEUNG: Society of Petroleum Engineers. So, in 2007 I became the chairman of the Petroleum Society of CIM. But, before that I was on the board for a few years and I was also helping organize the annual technical conference. First, I was the chairman of the technical committee at the conference and then two years afterwards, they asked me to be the chairman of the whole conference. But, it's all voluntarily, I usually do it one year and then somebody else does it. Then, right after that they asked me to be the chairman for the Petroleum Society. But, interestingly, when I attended the conference I have to pay, even though I was the committee chairman of the whole conference, chairman I was the president of the chairman of the Petroleum Society I have to pay to attend the conference.

PMB: That's funny.

YEUNG: It's all by volunteer. Except, a couple of years they changed the rules, because I was also an instructor. I was teaching my heavy oil recovery course, but they give a complimentary registration to the instructors. So, I could attend the conference free that way.

PMB: Such a deal. I understand also that you have taught a technical course on SAGD and on related engineering issues?



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YEUNG: Right. The first part is when we had a conference in Fort McMurray and people didn't know about SAGD. So, before the conference they were talking about, "Why don't you give a talk on the SAGD or SAGD 101." So, it was only probably a three or four talk. But, later on when we became the chairman of the society and also organized this conference, they said, "Well, why don't you give a longer talk." So, actually it changed to a half day and then it was a one day. So, the last six or seven years I've been teaching a one day, short course just before the conference.

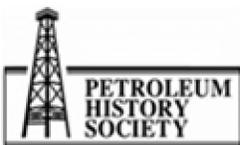
The conference usually starts from Tuesday to Thursday; Tuesday, Wednesday, Thursday. So, on Monday there will be instructors teaching various courses. So, I'm teaching the heavy oil recovery and SAGD. So, half a day on the overall heavy oil recovery and then half a day to concentrate on SAGD, because many people are working on the SAGD but they don't know much about SAGD. So, it's not just the technical people, sometimes they have investors, bankers or people who are only involved in the constructions, the EPCM companies. The EPCM is the Engineering Procurement Construction and Management, those are the people who are working on the design, but they don't know about the operation. So, my course is to give an overview of the whole thing. So, it's very popular. So, I was teaching this in June in this SP oil conference. It was sold out. There were about 45 people who came to my course. So, I do this in these conferences and also at the World Heavy Oil Congress.

PMB: The technical people, do they tend to be young or can it be all age groups?

YEUNG: Both, all age. They are people who just joined the SAGD industry. They have worked in the conventional before and even now these are people from the pulp and paper companies that come to Canada, come to Alberta to work on the SAGD projects. So, it's quite interesting there is a variety. Then, the surface companies' people who are involved in different aspect and they provide support to the SAGD projects. But, they do not know how we operate on the SAGD. So, actually my course gave a little bit of introduction of the history of the project. And, of course all this recovery process has some history. First, we started with this and then we evolved into different processes. And, now there are some ones that haven't been commercialized, but we are working on it. So, we also talk about this emerging recovering technology. I like to do that, I like to share my experience and I like to give back to the industry; this what we have done and this is what we are planning to do.

PMB: I'm going to leave it open to you, any last comments? This has been a tremendous interview, than you.

YEUNG: Thank you for giving me the opportunity to share my experience. My whole career is in the oil sands and heavy oil. And, I think I'm lucky to be involved in that for quite a few years, where before the SAGD became commercialized. Every year you worry about whether you have a job next year, because we're not making any money. Experimental projects when the oil prices go down, they may shut down. So, that's why for a couple of years at Suncor I was the only engineer of the heavy oil; just the manager and myself and all the other people are gone. But, they still need somebody because we still have this Burnt Lake project. We need to earn it. So, we needed a reservoir guy and



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I was the supervisor and I had the most experience and I know the history of all that on the more technical side. So, coming up with a new recovery process, they kept me. Even though I asked to transfer, "Can I go to the gas department?" At the time, gas was supposed to be the future too. And, they say, "No, no. You have to stay there." Then, I got stuck. After working for Suncor for 30 years, people know about me, right. I am always in heavy oil. So, when they are thinking about heavy oil at Suncor then it is always me.

PMB: You mentioned in the early days it was the economics of the industry that always put the sector at risk. There is an argument now that what really puts the sector at risk has more to do with public opinion and all this stuff about dirty oil, the European attitudes and really Canadian and North American attitudes. What would you say to somebody who said, "This is dirty oil and it's polluting the planet?"

YEUNG: I think I would probably quote what the cap is using in some of the slides. And, I put the slides in my course in my introduction to talk about this greenhouse gas emission. So, the oil sands right now, they emit around maybe 8% of total Canadian greenhouse gas emission and then Canada is around 2% of the whole world; so, the 2% and then 6%. So, Canadian Oil Sands is less than one-one thousandth of all the greenhouse emission. So, when you shut down the whole oil sands operation, it does not affect much. So, I was kind of surprised people don't understand that. They say, "Oh, it's the dirtiest oil in the world." But, you look at the coal generation in the US. And, the coal initially thought was clean, but where they get their electricity from. It was from coal. It is a lot dirtier than oil sands. And, also California with their thermal projects, because they use a lot more steam, the projects are very more mature. So, there is not much oil left, so they generate the greenhouse gas on a per barrel basis and it's even worse than our oil sands.

PMB: I believe in California, using that as an example, they have grandfathered the big southern California reservoir, basically bitumen or tary, it's fairly tary oil which actually produces more CO<sub>2</sub> emissions than bitumen.

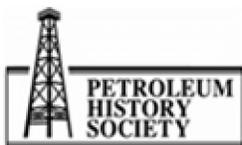
YEUNG: Right. I mean, you look at the facts, but most of the greenhouse gases generated are from driving our car, when you burn the gasoline.

PMB: That's about 80% isn't it?

YEUNG: Yeah, maybe 50% or probably, yeah.

PMB: I think it's 80%.

YEUNG: But, I'm saying when you look at the whole greenhouse gas emissions, I mentioned the oil sands is around 80%. And, then the transportation part is maybe 50% and then the other for electricity and then all the other stuff. But, the production of oil sands is a small percentage and they target the oil sands, because it's easier. People, it's good and you look at all this and I think that some of the environmentalists are just dramatize the whole thing. I was giving a talk, a one hour talk several times and one is for SPE, about the evolution of the oil sands development in Alberta



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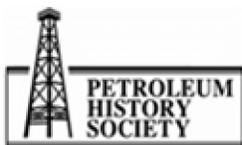
starting from when we first found oil as compared to the conventional. Conventional oil is the Leduc or Turner Valley. But, it is 200 years after we knew that there were oil sands there. But, when we look at that and we look at some of the comments from other countries, I remember the National Geographic they talked about the tailings ponds, right. And, they showed a picture of a tailings pond and they said, "Wow, look at that. It's the size of Britain." But, then realize that the mining part is only a small part, so just mining. The mining is 10% of the surface area of the whole Athabasca Oil Sands deposit. When you look at the oil sands deposit, yeah it is the size of Britain, but it is only a small part that is mining, the other is in-situ. Another comment is from another magazine or whatever where they mentioned about a tailings pond is the size of the whole City of Vancouver. So, when they mentioned it was the whole city, you would think that the whole City of Vancouver is very big. Actually, it's just the Vancouver Proper.

PMB: Which is on a little peninsula?

YEUNG: Just downtown area. It does not include Richmond. It does not include West Vancouver, Coquitlam, Surrey or other places. But, when they say the whole city, people say, "Oh, yeah, the whole thing." But, actually it is just a small area.

PMB: Okay. So, a lot of it is unfair. Well, I'm going to turn this off and thank you very much for a really interesting, very technical interview. Thank you.

[END OF RECORDING]



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