AL HYNDMAN

Date and place of birth (if available):

Date and place of interview: Total Offices, 28th Floor of the BP Tower

Name of interviewer: Peter McKenzie-Brown

Name of videographer: Peter Tombrowski

Full names (spelled out) of all others present: N/A

Consent form signed: Yes

Initials of Interviewer: PMB

Last name of subject: HYNDMAN

PMB: Okay, I'm talking to Al Hyndman. I'm just checking to make sure that I can hear myself. Would you say something please, Al?

HYNDMAN: How's my voice? Why am I a little hoarse today? Maybe I should get some lemon juice or something.

PMB: I think it's just bad luck. I'm with Al Hyndman, and we're in a Total boardroom, on the 29th Floor of the BP Tower, and it is, let me see now, it's the 16th of August and it's in the afternoon. Okay Al, I've studied our last interview pretty closely based on the transcript and there were a number of fairly important things that I wanted you to clarify or elaborate for us a little bit.

One of the points that you made was about pro-rationing and I remember that the industry got, or the government got rid of pro-rationing in the 70s or it might have been as late as the early 80s. I think it was 70s. Can you talk about what that was, why it was government policy and how it affected the Great Canadian Oil Sands Plant.

HYDMAN: Okay. So market pro-rationing was a procedure by which production of oil wells, in this case, in Alberta, were pro-rationed – that is, their production was set by the Energy Resources Conservation Board, it was called the Oil and Gas Conservation Board at the time, to the market demand and that market was set by refining nominations. North America Refineries...

PMB: So you know I've got refinery nominations here...

HYNDMAN: Nominated for oil.

PMB: You're really saying they're orders.

HYNDMAN: They're orders.

PMB: A nomination is an order for oil.

HYNDMAN: An order for oil. And so the production was pro-rationed to that market demand. You know this was a procedure that had been set up by the Texas Railroad Commission back in the early days of Texas, so it was replicated for the Alberta scene. There were other mechanisms used in the world to, I guess you could say, create this system of orderly marketing of oil to demand.

PMB: That was done in Texas and Oklahoma because there was so much oil being discovered. There was relatively so little demand, that basically oil was selling for nothing, selling for $0.50 a barrel or something.

HYNDMAN: You know I think that's the common perception that these mechanisms were put into price protect producers, but it also had another effect. It provided a stable market and I think you could actually argue the opposite, that because the volatility of prices was removed by this mechanism and as you had a more stable situation, that that allowed environment for investment and for production to expand. So one might argue that post-war Europe was rebuilt during an era of very great supply of oil and very predictable supply and cost of petroleum, so I think it had a very stabilizing impact. Of course, you know in the 70s OPEC came in and took over operation of the middle-east oil fields and did things in their own way and as you say, pro-rationing was eliminated in Alberta, I think it was, in the 70s. And of course since then we have had much more volatility. We've had higher prices, but we've also had a lot of volatility which sometimes doesn't support orderly investment.

PMB: Okay, and so this idea then was to, the idea was to create a stable environment for the oil industry because you knew that, you knew that you would have a market essentially. Even if you couldn't use all of your oil, you could use half of it.

HYNDMAN: You could produce some of it, yeah.

PMB: Now how did this affect the Great Canadian Oil Sands Project?

HYNDMAN: Well if it affected both Syncrude's big cursor, Cities Service, Athabasca and Great Canadian Oil Sands by virtue of the fact that, I mean it was recognized and known that if you built an oil sands plant mine and processing facility for a certain capacity, the only way to make it economic would be to run it at that volume. So any project like that would have to be excluded from pro-rationing whether production would be shut-in. This of course was resisted by the conventional oil producers and so the Manning Government at the time put out a policy that oil sands could be produced subject to pro-rationing but they would be restricted to 5% of the total volume of

production, of average production of the Province. Which at the time was 31,500 barrels a day, so that was their policy at the time of the applications for commercial projects by Cities Service Athabasca Inc. which was the precursor to Syncrude and Great Canadian Oil Sands which was the precursor to Suncor, so the Cities consortium put in an application and indicated that volume, 31,500 was too small to be an economic project and came forward with a proposal to produce a plant of a 100,000 barrels a day and indicated that there was market there for the oil, it wasn't necessary to restrict it to that lower volume.

The Great Canadian people at the time, Tom Clarke was one of the leaders, and I don't think any kin of Karl E. Clark, and they proposed to build one within the policy of 31,500 barrels a day. So the ERCB granted their approval and deferred the approval of the Cities consortium to some indefinite period in the future. As I mentioned previously, Sun Oil took over the Great Canadian Project and backed it and they brought in the Bechtel Corporation to do engineering on the Project and they did come back and request an increase of the 31,500 to 45,000 barrels a day, so some recognition that economies of scale were needed but they didn't go to full 100,000, so I think in retrospect certainly those economies of scale are important and they're real.

PMB: Now Cities Service Athabasca, when Cities originally made the proposal, were they thinking of doing the whole project themselves, or what group did they have?

HYNDMAN: No they had Imperial Oil and...

PMB: And Arco.

HYNDMAN: Atlantic Richfield and Royalite, which became Gulf Canada.

PMB: Okay. It was bought out by Gulf Canada, Royalite was?

HYNDMAN: It was, so it was 30% Cities, 30% Atlantic Richfield, 30% Imperial and 10% Gulf Canada.

PMB: And so this is the Project that with the Winnipeg Agreement in 1975 essentially became Syncrude?

HYNDMAN: Yeah, that's correct. I think Syncrude was set up just before my time at Syncrude. I believe in late 1964 they renamed the Cities Service Athabasca Inc. consortium to Syncrude but it was still with those same members and then as you alluded to in '74 while I was off in the engineering office in San Francisco, that agreement brought in the three governments, Alberta, Ontario and Canada, to pick up the proportion of the Project that had been left vacant when Atlantic Richfield vacated the Project having to deal with large costs that they encountered in their Alaska Project as Prudhoe Bay. The pipeline had undergone huge escalation and their North Sea projects which they hung onto also.

PMB: Okay, good. Now one other thing, and I don't know whether you have any information about this or not, but I believe that the Mildred Lake area, which became part of Syncrude, was an experimental site back in the 1950s with Cities Services, the operator. Is that correct or am I just plain mistaken there?

HYNDMAN: No you're correct. There was a pilot plant operation that was run from 1959 to 1963 and that's where bucket-wheels were brought in to mine and feed the oil sands extraction operations where the basic scheme using the tumbler, the Clark Hot Water Process with its primary separators, flotation cells, diluting the bitumen to remove the impurities in the froth treatment process, so that basic process was set in that '59 to '63 period and by and large was emulated with the commercial developments of Suncor and Syncrude.

PMB: Now you've mentioned that what was important with the large scale of the Syncrude Project were economies of scale. Was there anything else that was really important with the large size of the thing? Was there anything more than just economies of scale?

HYNDMAN: Well I think there were a few new things that were introduced. One of them is that we didn't believe that we could burn the amount of the coke that had been used in the Suncor operation to supply the energy into the extraction operation. So what we did do is we introduced a lot of energy integration of recovering heat and stanking steam pressures in the power and steam cycle in the utility plant and in the by-product heat generated in the up-grader and transferred a lot of that heat into the extraction operation. So I think we stepped up the degree of energy integration that one sees in the facilities to the point where not much more of it has been accomplished to date.

PMB: You mean to this day, it is not more integrated than it was then in '78?

HYNDMAN: No, not any more. In fact, some of the subsequent projects we did weren't as energy integrated. They were more energy efficient because we've been able to make the extraction process more energy efficient, but from an integration standpoint, the original Syncrude plant was very efficient in terms of the way in which power steam and by-product energy out of the upgrader were used. There were their differences, the nature of the mine area and the ore body lent itself to putting draglines in with bucket-wheel reclaimers, rather than bucket-wheel excavators operating on the bench. There were some subsequent surprises that made the use of those machines less effective than they could have been, but make no mistake, those draglines were very efficient digging machines and in the right mine plan context, they can be very useful. But with the truck shovel systems that we have today, neither the bucket-wheels which were less reliable, nor the draglines are seen as useful in any of the context that we have with the current mine plans.

PMB: The original Syncrude, was it a one train or two train operation?

HYNDMAN: Two. Everything was a... there were four extraction trains and two trains all the way through upgrading, two cokers, two gas hydro-treaters, two hydrogen plants, everything was a duplicate.

PMB: And what was the advantage of that?

HYNDMAN: Well even at that, the fluid cokers that we built were twice as big as anything that had been built before, so they were reaching the limits of expanding that process, so it was necessary for the capacity we had, to have two, and each of the hydro-treaters, the hydrogen plants were as big as any had been, you know, we had two of them and each one was as big as any in the world, so part of it was just the scale of equipment of the day and you know, once you're going to be two trains most of the way, from a reliability standpoint, it's useful to have two trains always...

PMB: And that was going to be next question, so if one part of one of the trains went down, were you able to increase throughput in the other?

HYNDMAN: It wasn't designed that way, they were 50% units but what was perhaps very important, is with all this energy integration that I described earlier, it was very important to keep the upgrader running through the winter to make sure that the rest of the operation had the fuel, the steam, and the hot water that it needed to operate. So I think that two train concept was a good one for an operation that has to run in severe climates, in quite a long duration of winter.

PMB: Okay, good. That's a surprise, I didn't except that at all. Okay now, this is a little bit related. It certainly follows. In 1984 there was a fire in one of the cokers, and I remember the headlines and following it for a little while. Then it sort of disappeared from the headlines but it went on for years as a court case and there was haggling about it and this kind of thing. Now it would be inappropriate for me to ask you to talk about anything in the court case that was agreed to be private, but could you tell me what happened there and could you tell me how serious an incident was this, and what did it do to the operations?

HYNDMAN: Well it was a very serious incident, I do remember it well, I was no longer Upgrading General Manager when that fire occurred. I had been actually when the piece of pipe they drill it into went in, but I remember, I can't remember what we were meeting on the next morning, but I remember we were flying up there and flew over the fire which had just been extinguished and it was extensive damage, 900 pound steam lines bursting because of the flames and heat.

PMB: How big was the coker, in metres, and maybe, how high did the flames reach?

HYNDMAN: Oh the flames went hundreds of feet in the air. It was a big fire, but that in itself doesn't indicate anything, because big fires of hydrocarbon can look very spectacular. It was the equipment damage, particularly to the compressor house where we had a 30,000 horsepower axial air compressor that supplied air to the fluid coker...

PMB: Sorry what was it? What kind of compressor?

HYNDMAN: An axial air compressor that supplied air to the fluid coker.

PMB: How do you spell that? A-X...

HYNDMAN: I-A-L.

PMB: I-A-L.

HYNDMAN: That's not significant...

PMB: Air compressor, okay.

HYNDMAN: It was large, it was 30,000 horsepower and another gas compressor that was somewhat less in power, but both of these were damaged as there was extensive damage to piping instrumentation, electrical equipment, so it caused both units to be down for a month and then the one unit that was engaged in the fire was down for over six months, so as you alluded to, there was a large court case that had to do with that lack of diligence in putting in this piece of pipe that was the wrong metallurgy. It was carbon steel and should have been chrome steel and that's why it failed. It gradually corroded over a period of four or five years until it was so thin that it burst and released a lot of what we call slurry oil, but hot oil at 700 degrees Fahrenheit and this oil auto-ignited and burned for some time.

PMB: Now who was suing whom during that, you don't need to name names, was it Syncrude suing contractors? Over what exactly did who sue?

HYDNMAN: Correct. There was Syncrude and its owners really suing for both equipment damage, lost production, to the contractor that had installed he piece of pipe.

PMB: And it was just a guy with a...a pipefitter basically who picked out the wrong piece of pipe?

HYNDMAN: Well he was issued the wrong piece of pipe. I mean here's the thing, that's a very difficult weld to make, to put a carbon steel piece of pipe welded to a five chrome. It's a very…You know, you have to be a good welder to do a good weld in that service, and it was a good weld. It was well done.

PMB: The guy was very competent. He was not at fault.

HYNDMAN: The stamp, the evidence was all there as to who had done it when it went in, but it was the wrong material and, frankly, this happened in a couple of other places around the world, during that same era and what it came down to is better control over... So after that, I think what was adopted by Syncrude and generally more universally across the world in the hydrocarbon processing arena, was to go to positive metal identification which means that any piece of pipe or fitting that goes into that severe hydrocarbon service is positively identified as to its metallurgy before it is put in, so that procedure was adopted as one of the outfalls of...

PMB: So that was an outcome of that particular, one of the few positives out of that horrible mess. And that train was essentially out of service for six months, or was it the whole plant?

HYNDMAN: No no, the whole plant was down for a few weeks, but the one coker and half the place was back up running and then this other unit that was more extensively damaged was down for, it was more than six months, and there were some very heroic measures to keep down the duration of that repair, such as borrowing large aircraft from the U.S. Air Force to fly compressor parts and steam turbines back and forth from the original manufacturers from Hamilton, Ontario and Milwaukee to shorten the transport time so they didn't have to be trucked back and forth. Those were the kind of things that were done to get back into production.

PMB: '84, now that was...okay, at that time of course, oil prices were very high and so the lack of production was costly, wasn't it?

HYNDMAN: Losing a lot of money, yeah.

PMB: There's a lot of money involved there. Okay, thank you very much. Do you have any idea what the out-of-court settlements were? If it would be improper to say, don't.

HYNDMAN: Well I think, you could go to the public record and find out that people were after, in total, hundreds of millions of dollars but it's best not to comment further I guess on that or my views, or what impact that kind of litigation might have had on, positive and negative on the behaviour of contracting firms.

PMB: Of course, you're going to be a lot more careful next time, as a contractor, as a service firm, if there are hundreds of millions of dollars, even if you don't lose, you have to defend yourself.

HYNDMAN: Yeah, and it did unleash a whole train of insurance and other activities in succeeding years.

PMB: I'm going to ask you this question, I've asked different people and I get different answers and they're not all consistent. I had the feeling that within the oil industry there was huge move toward safety which began in...which really ramped up in the 1980s, particularly in the 1980s, and of course, it's become very sophisticated now. Am I right about that? Do you have evidence from Syncrude?

HYNDMAN: Yes you are I think. You know, you could go to their record and track the accident rates...

PMB: Lost time accidents.

HYNDMAN: Lost time accidents over those years, and how they tracked down.

PMB: It came down quite a bit.

HYNDMAN: And I think that was true of any of the large firms running these big operations that in general they have made improvements.

PMB: And there's been government pressure for that too. I recall in around '88 there were a whole bunch of people – I don't know, ten or something – killed on the rigs in one year. It was something like that, and then the minister in charge basically really put the screws to the operators on the drilling rigs.

HYNDMAN: On the drilling rigs, yes. I think on the oil, you know, in the oil sands operations it was more self-motivation within the organizations themselves, plus the fact that it's costly to have accidents and you know, worker's compensation premiums, that sort of thing. There's lots of reasons that go beyond the pure reason that we all should be concerned about that. None of us wants to be hurt or wants any of our colleagues to be hurt, but there's good business reasons for doing this as well.

PMB: Good, okay. Now, when we talked last time, we talked about two of the following three leaders at Syncrude, and I'd like to get a little bit more information from you about them. One, of course, was the president when Syncrude opened, Frank Spragins who died about six weeks later of, I believe, it was cancer. I believe he was followed Jim Carter.

HYNDMAN: No he was followed by Brent Scott.

PMB: Brent Scott, okay.

HYNDMAN: And actually, let me correct something here. At the time that Frank died, he was the Chairman of Syncrude's Board, with the owner absent. Brent Scott had been the president for several years, so let me go back and say that Frank was the one that set the scene I think for Syncrude and for the oil sands in general, just tirelessly making the case for the development of the oil sands in Canada with the Alberta Governments of the day and with many other stakeholders as well. So Brent sold the idea of the oil sands both to officials, to the public, to other stakeholders and to our owner companies. He was tireless in that.

PMB: So are you talking about Brent Scott now or Frank Spragins?

HYNDMAN: Frank Spragins. Brent came in to Syncrude to really build the plant and really staff up the organization; you know the technical and business organization.

PMB: He came from Gulf didn't he?

HYNDMAN: And he came from Gulf Canada. He did. He had recently managed the project where they built a new refinery in Edmonton and one in Point Tupper, Nova Scotia, so he came off those jobs to see that Syncrude got built and as I say, it was under his tenure that a great techno-structure was built in Syncrude, not the research organization, that was already there under Frank, quite a sizeable R&D effort that has been sustained until this day, probably, bigger than anybody else in that field, but all of the engineering and the business service that is in the structure that one needs to run a big operation like that, were built under Brent.

PMB: Okay, now I have two other names: Jim Carter and Eric Newell. How did they fit into the picture?

HYNDMAN: Okay, well let's reverse the order and talk about Eric because he was before. Eric also is a great champion of the oil sands and, as you know, it was under his tenure that we worked on the National Oil Sands Task Force. Eric was somebody who championed excellence and operations as a core feature that one has to have in this business if you do nothing else right. You have to start with that, but Eric also was a tireless promoter of Syncrude and the oil sands and it was really under his tenure that we broadened our interest to bring in other stakeholder, the rest of the industry, and to promote the growth of the oil sands as a part of the public interest.

So you know, I was challenged, and grateful and pleased to work on that initiative, the National Oil Sands Task Force and my piece of it, strangely for an engineer, my piece of it was the tax royalty system that we operated under and we were able to effect I think great improvements in that and changes that did allow for growth. Some of those have been undone in the last few years, but the industry underwent great expansion after that task force effort. Jim Carter came in as a mine operations person into Syncrude and Jim's forte I think was a very strong operational diligence and I think if you look at the history of Syncrude, his tenure and Eric's before him, would show a period of great stability and production and operating costs.

PMB: Approximately when did he come on-side? When did he take the president's office?

HYNDMAN: Oh dear.

PMB: Mid-90s?

HYNDMAN: Early 2000s?!

PMB: Oh it was that late, okay.

HYNDMAN: Yeah, so I think if you look at that period of Eric through Jim that was a period of very stable production and costs for Syncrude.

PMB: That was the Golden Age.

HYNDMAN: It was a Golden Age for operational performance, it was.

PMB: Okay, good. Anybody else that you can recall from that period that really made a huge impact, or was it really the top guys who did the...?

HYNDMAN: Oh no, there was a lot of talented people in Syncrude, some just very good people in all sorts of positions. I mean, to run an enterprise like that you have to have good business systems, you have to have… We had some excellent people in the automated control, just top notch people

that I had the pleasure of working with, Peter Reavill, Azim Karim, working in those areas - wonderful.

PMB: I'm sorry, I missed those two names.

HYNDMAN: I said Peter Reavill.

PMB: Reavill, R. How is that spelled?

HYNDMAN: R-E-A-V-I-L-L. And Azim Kareem who just retired from Syncrude recently, had a long, long career.

PMB: How is his name spelled?

HYNDMAN: K-A-R-I-M.

PMB: Okay.

HYNDMAN: We just had some excellent performance in that area, my friends John Clark, who was the research director for quite a period there and others in engineering – Peter Ambrose, just great people to work with, a lot of very excellent people in Syncrude.

PMB: Okay and you believe that's still the case. You're still in touch with some people aren't you?

HYNDMAN: It is still the case. I think the growth of the industry and some other factors have caused a lot of the talent to be dispersed around town here, including me I guess, in a retirement mode, but Syncrude has still got a very strong core of people.

PMB: Okay now I want to talk about, and I'm pretty sure, I don't know this, but I'm pretty sure that Eric Newell was behind the drive toward aboriginal hiring and aboriginal business development in the late 80s. Can you confirm for me that that's true?

HYNDMAN: Well he certainly was, but let me go back and say that Frank Spragins started with… I can remember him talking to Harold Cardinal years before we ever started up and started into the project, and I do remember that, as going into operations in 1975-76 period, that a group of us went around to all the aboriginal communities in the area, a couple of years before we were to start up to dialogue with them. We had aboriginal contracts that were let, right from the initial operation, so Syncrude had a track record of aboriginal hiring and aboriginal business development that went back to the beginning of the project and was operating at a level that few other companies in this country were at in that period.

PMB: Now what kind of contracts were you letting in the very early days?

HYNDMAN: The Good Fish Lake Indian Band had a contract to handle all the worker laundry from the Fort McMurray operation, and local aboriginals were hired to handle some of those, to handle the coming and going of a lot of that. I know that intimately because I still have a very good friend who lives near me, out in Vancouver Island, and she managed those people. Her husband was an executive with Syncrude and she managed that aspect and set up the system and trained some of the people to handle the flow in and out of that laundry system, so I think you can argue that we stepped up this activity through various phases but it was there from day one, and it was there at a time when few other companies in this country were operating at that level in that field.

PMB: Now what I understand is, at that time, we're talking about the late 70s, most of the people, most of the aboriginals in that area, made a living from trapping and of course, at about that time, Europe put a boycott on Canadian furs, because of, I think it was the seal hunt or something, with the result that that whole industry collapsed, do you know anything about that?

HYNDMAN: I think that's true but I think it's also wise to re-calibrate your metrics as to what constitutes an adequate living 150 years ago to today and just setting aside our own aboriginal population and any small problems in retrospect, which may appear as bumps in the road, on their transition from hunter-gatherers, to what we would describe as an adequate living today.

I mean in the world generally, if you went back a couple hundred years and for millennia before that, most of the people in the world were engaged in growing their own food for themselves and maybe the 15 or 20 percent of the people who weren't farmers, who were engaged in commercial. That was the case for thousands of years. But today, a few percentage of people are engaged in food production, so it's a much smaller piece of our economy and we expect to have a lot more out of life. So whether or not the fur industry would have undergone a collapse due to international forces like that, I think you would still argue that for most people, a living based on the kind of income that you can generate out of that activity would not be seen as adequate today. So you come back to the fact that the only real answer is to get everybody engaged in one way or another into some component of the larger economy.

PMB: And that brings us to Syncrude's initiatives on aboriginal employment. So it was there from the beginning and Frank Spragins was an important advocate. where did Eric Newell fit into this?

HYNDMAN: Well I think every president that Syncrude had...

PMB: So Brent Scott as well.

HYNDMAN: Had to carry that relationship and John went all the way through, that was a consistent. You have to be patient in this business, it's not a simple thing, but what you want to support is the entry of the local people into the mainstream economy either with direct employment, with setting up of businesses that are owned and operated by the people of those economies. And this is not something you can make happen overnight. It takes persistence and patience and that's been a feature of Syncrude leadership through the [pace. piece].

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PMB: What would you say were the main reasons for their success and maybe also the main challenges that they had?

HYNDMAN: Well I think the main reason for the success is to focus on the fundamentals. If people are going to come into the modern workforce, education is important, so encourage education, you support remedial education where it's necessary, so giving people a break and saying, we will use patience and assist you to bring up your education to our minimum standard requirements and we will give you first call on employment. Employment assistance with education, assistance with business development, those are the things you should focus on.

PMB: And in business development, it's my understanding, I was speaking with somebody the other day, the name is forgotten, John (Rhind)...he's a Vice President of Shell who used to work for Syncrude. I guess in the 80s his job was to go around and identify aboriginal businesses and help the business become better so that Syncrude could use them, so that they could become more effective businesses within the community.

HYNDMAN: Yeah, there was a lot of that work done, yeah.

PMB: Okay, good. I wanted to capture that because I think that's an important part of the story and nobody really talks about it very much, although I do understand and you can confirm this I think, that Syncrude is today still the biggest employer of aboriginals in Canada.

HYNMAN: I think you can find that information on their website and I think you're correct in your...

PMB: Okay, fair enough. When we last talked, we were talking about the tailings ponds and the problem with getting clay suspensions out of those ponds and reincorporating them into the land mass. You said that this was… In some ways, this was Syncrude's greatest challenge, but you said it could be done. You said the challenge for the industry is to do it at a reasonable cost, because right now it has to be done, but it's a very expensive proposition.

HYNDMAN: It's probably worth going back a little and talk about what the emphasis was on tailings management, at the commencement of the industry. At the beginning, the important thing on tailings was to have high integrity of the dams, these recycled water ponds where the clays settle, as you say, but whose function is to take care of the disposal of the tailings as the plant is operating and provide a place for the recycling of the water, most of which is recycled, reused in the process.

So dam safety, geotechnical integrity of those facilities was the priority and I guess people have kind of forgotten about that because here we are 40 years later and we've never had an incident of a tailings breach or anything like that in our industry. There have been such incidents around the world, so, the first thing I would say is that geotechnical integrity of those facilities remains a top priority of the industry and the record is very good. We have world class design and world class surveillance of this. I remember that Brent brought in and introduced the concept of having a

geotechnical review board, which was originally chaired by Bob Hardy, who was the Dean of the University of Alberta.

PMB: H-A-R-D-Y?

HYNDMAN: And a geotechnical engineer and initiator of Hardy & Associates which is now part of AMEC, but there were top people in the world on geotechnical matters on that board from day one and now virtually all operators have similar internal review boards. Originally a large part of the rationale for that board was actually, we had dragline high walls, so we had these huge machines sitting on a cliff that was 50 meters high.

PMB: Sorry you had what huge machines on…?

HYNDMAN: Well, the dragline machines.

PMB: Oh, was sitting on the... right, okay.

HYNDMAN: Like it was a small hotel, right, sitting on the edge of this escarpment and of course, the risk to people who weren't normally engaged in that business was obvious and there had been…. So a big part of the geotechnical review boards at the beginning was the safety of the dragline high-walls, the other part of their jobs was to review these tailings dams. So that's there and it remains in place today and all of the oil sands operators have similar boards in place, let's not forget that just because it's been successful, it is still the most important part of this.

PMB: Before you go on, I do want to say that it was about a year ago there was one of these ponds failed in Hungary. Do you recall that?

HYNDMAN: I do.

PMB: And then apparently, it just washed right through some villages and it was acidy and it would burn people as they got in touch with it. Then it went off into the Danube and was eventually dispersed. The outcry was absolutely horrible about what had happened. Of course they very likely would have created that dyke during the socialist era.

HYNDMAN: Probably, you know, and the other thing about some of those.... If you have acid rock or things like that, you can have much more difficult materials than we have to contend with. Our challenge is there are more benign materials but boy, there's a lot of it, right, and I mean these are huge mining operations.

So you alluded to the clay, so I guess we should clarify how that occurs. There are, in addition to oil sand, there are clays and fine silts in the oil sand that are there as well. If it was just oil and sand, our life would be pretty simple in the tailings area but there are these clays so that, in the process of dispersing all these materials so that you can recover the oil in the extraction plant, you take apart the matrix and when you then deposit the sand, some of the water and the clay and all that, stays in

the voids as it settles, but that portion as it runs off has the clays in it. And these do not, they do not settle to a dense solid, they settle slowly for the first couple of years, then after about two years they'll get to a density of about 30 percent solids by weight, which is mostly water by volume, so it's muddy water and it doesn't want to get any denser.

So the question is, how do you handle that in the closure landscape of a mine? What do you do with all this stuff when you want to close the mine? There are a couple of things that can be done, let's just say three. I really have to reincorporate those somehow into the sand matrix and have a sand that has higher clay content in it, or you have to figure out how to solidify the material itself into a dense, I guess, turning muddy water into mud and then into soil. A third method is, a certain amount of it can be left in the bottom of a mine pit and lake water put overtop of it and so long as it will stay there and the transmission of some of the organic naphthenic acids, things like that, that are biodegradable and naturally present in the waters in the area, that those are not too concentrated in the surface water. So those are the three things that are done.

The methods that turn those fine clays into a solid mud are, it's not simple, they don't want to densify, so we use chemicals, it's the main reason flocculate and time and self-weight consolidation, these are the techniques. They take area, they take time, and they take chemicals, money to handle. So there's a very intensive effort on-going by all the companies on that today and over the past three years or so, discussions were held and what was the outcome of those was to put in place something called the Oil Sands Tailings Consortium, which allows all the companies in surface mining oil sands, and there are seven companies that have operating responsibility for surface lease, all of them are members of that consortium and have agreed to share all of them.

PMB: What are those companies? There's Total, there's Suncor, there's Syncrude, there's Imperial, there's Shell...

HYNDMAN: CNRL.

PMB: CNRL.

HYNDMAN: And TECK

PMB: Who's the next one?

HYNDMAN: TECK.

PMB: How is that spelled?

HYNDMAN: T-E-C-K.

PMB: Oh okay, that's one I missed. I didn't know about that. Okay.

HYNDMAN: They don't have an approved project, they have an interest in the Fort Hills Project and they have the Horizon project of which they are the operator for themselves and their partner, so they're in the future business.

PMB: Okay.

HYNDMAN: So all seven of those companies are members of this Oil Sands Tailings Consortium. All have agreed to share all of their technical information in relation to tailings, and agreed to...

PMB: And what about other environmental...? Is it just tailings or is it…?

HYNDMAN: The Tailings Consortium is tailings. So they've agreed to share all their information, to have no intellectual property barriers between the companies, to cooperate on the development of methods to improve the management of these tailings, and to be more transparent with third party developers, regulators, the public with what the issues are with the tailings so if there are others that want to work towards solutions, they will have access to that information as well. So that's quite a challenge to get seven companies with competing interests, who are normally used to competing and not sharing, to all say we will cooperate in this arena, for the good of us all and for the public.

PMB: Now there's been a lot of coverage in the newspapers in the last couple of months, and I forget whether it's Shell or Syncrude, or sorry, Shell or Suncor, has come up with this system which can essentially dry out tailings.

HYNDMAN: There are several, what Shell and Suncor are doing, they have different names for it, but fundamentally what it is, is using a polymer flocculent which aggregates these clays.

PMB: Polymer. P-O-L-Y-M-E-R. Flocculent.

HYNDMAN: F-L-O-C-C-U-L-E-N-T. To initially de-water this material and then it's spread out on a large surface and other drainage occurs and then atmospheric effects also help to de-water it, that evaporation and drainage down into the sand below there. So that's that method, and in the way it's being operated today, after a layer, this material has produced a layer or two, it is picked up and moved and disposed of with overburden in an overburden waste dump, so that's one method. Syncrude is working with centrifuges to accelerate that initial de-watering and get into a more dense mud and right within in a process and then after that, to also either pump it or truck it to disposal sites as well as a solid. So these are methods that are being commercialized today, they're obviously costly because you've got to move the stuff around. And in the case of the centrifuge, you've got the capital cost of those machines. In the case of thin layering, there's a lot of activity to handle the large areas and pick the material up and move it back, so I alluded earlier to the fact that if you're not worried about cost you can probably do some of these things. What we have to do is find other ways that are more cost effective for disposing of these fines in a solid matrix.

PMB: When that stuff is recovered and it's disposed of, it never ends up on the surface, it's somewhere down in the mine, is it?

HYNDMAN: Both.

PMB: Okay, so it's clean enough that it could actually be put on top of the earth?

HYNDMAN: Yeah, you put topsoil on it and, I mean, my own bias is that soft material can go either place, but preferentially, putting them in the mine pit can make certain aspects of that disposal easier.

PMB: Okay, anything else on that, because the tailings ponds and the clay suspensions, that has been a huge issue.

HYNDMAN: It's got a lot of press, yeah.

PMB: But still it is resolvable now, but it's very expensive.

HYNDMAN: I think it's a manageable issue, yes.

PMB: Now, I interviewed Rick George the other day and he said something about SOx and NOx and COx. I had to clarify for the transcriber what that meant, but I'd like to talk about those things, Sulphur, Nitrogen and Carbon oxide emissions – mostly CO_2 emissions. I think it was Vern Larson who told me that when Suncor and Syncrude were originally set up, nobody cared about carbon emissions. They were concerned about the NOx and SOx because of the fear of acid rain at that time, and that was what was getting the publicity.

HYNDMAN: Well that's true, but let's first say that emissions in the Fort McMurray area did approach, even by an order of magnitude, the issues that you had in central Canada with both the Sudbury operations of nickel sulphide ores, and the emissions from coal fired generating stations, not just in Ontario, but more significantly in the Ohio River Valley, that sort of thing, so we never did have acid deposition rates that approached the issues that peaked out in Ontario in the hayday of the nickel operations before they put in control measures there. But there was always the concern that we didn't want to get anywhere close to that situation, so when there were only two plants, some of the coke was burned, and its sulphur contained, so there was sulphur dioxide emissions. Since then, both Suncor and Syncrude have installed scrubbers so that their SO_2 emissions are a fraction of what they were when they started up, even though their production is multiplied several fold.

The other air pollutant from a regional perspective that acid producing, is nitrogen dioxide and that comes from combustion equipment as well, so that is dealt with by using low NOx burners and stationary equipment and in using the modern engine designs and the mobile equipment so the truck engines, with fleet turnover, some of the newer trucks have lower NOx emissions than the earlier versions, in the same way that your car, that you drive today, has lower NOx emissions than the one

you had back in the 60s, so those kind of improvements have kept acid gas emissions, even though the industry has grown tremendously, so now you've also alluded to carbon dioxide emissions, which is not a local air pollutant, but which is the contributor to the green house gas concentrations in the world atmosphere, and that's an energy efficiency issue basically.

I can say that in spite of this energy integration that we did in the early part of Syncrude, that the advances in energy efficiency in the extraction area have been quite dramatic, I think we're down to about a third of the energy that we originally used to run those extraction operations back when we first installed the Clark Hot Water Process, and I think there's more to go if you completely integrate all the knowledge today, there's another step of improvement that could be made there.

PMB: So the carbon, the CO_2 emissions are growing, although they're shrinking per barrel of production.

HYNDMAN: They're growing because no production's done...

PMB: But in absolute terms the sulphur and nitrogen emissions are in decline, they've shrunk a lot.

HYNDMAN: Well they have...

PMB: Is that for the whole area or is that per barrel?

HYNDMAN: Both.

PMB: Now there's one other thing, and I'd just like to throw it in here, perhaps you can confirm it. I'm pretty sure that one of the by-products of the withdrawal of nitrogen oxides from the system is the creation of ammonia, and if I'm not mistaken...

HYNDMAN: That comes out of the sour water, but anyway, but yes there is ammonia that is produced up there, yes.

PMB: And I believe a fertilizer plant on the Syncrude site is now taking that ammonia and turning it into fertilizer.

HYNDMAN: Ammonium Sulphate I believe, yes.

PMB: Which is a form of a...as a pelletized form. It is a fertilizer isn't it?

HYNDMAN: I believe you're correct, that was after my time, but...

PMB: I just wanted to slip that in because it's a really interesting side-bar on how the systems are developing, I think.

HYNDMAN: Yeah, that was one of the projects that was done shortly after I left.

PMB: Effluents.

HYNDMAN: You know, I did describe to you earlier the tailings dam construction and the integrity of those dams. But the other part of it, and the reason for them in the first place, is to operate a self-contained, no-release system with the process effected water, so the...

PMB: So there are a lot of efforts to keep re-using the water?

HYNDMAN: Yeah, there essentially are no effluents from those extraction operations today, eventually, the water that's in those recycle operations and in the, saturated in the sand, has to become part of the natural environment during mine closure, but that's…so that's something that has to be worked on, but in terms in the kind of effluents that you think of today where factories running with an outlet to the river, that does not occur in these operations today.

PMB: Now they have approvals to withdraw, I forget what the percentage is, the plant from the river, and my understanding is that the actual withdrawals are much less than the permits.

HYNDMAN: They are, they are a few percentage of the minimum flows in the winter and a much smaller percentage of the average flow, and you know, to put this in perspective, those allocations are a very small percentage of the flow compared to this river that you see out here...

PMB: The little Bow River.

HYNDMAN: The little Bow River and the south Saskatchewan system where quite a high percentage of that water is allocated, a lot of it for agriculture reasons...

PMB: For irrigation, mostly.

HYNDMAN: ...both in Alberta and reserving amounts for downstream in Saskatchewan so, there is just no comparison about the level of usage in water, in the northern waters, which are larger waters, with abundant water flow than the southern system so…. I think you can go and check but, about half the population of Alberta, most of the agricultural flow is on the Red Deer/South Saskatchewan systems which is basically Ponoka and south, and that accounts for seven percent of our surface water in Alberta, so we've got half the people, most of the agriculture on seven percent of the water. So we're actually very fortunate that those northern rivers have such an abundant supply of water.

Now there is one thing that is worth paying attention to, on the Athabasca system, apart from making sure that there's no releases of water that would be deleterious to the system. And that is that the Athabasca River, alone among the major rivers in Alberta, has no dams on it, so that the winter flow is the natural winter flow and it goes quite low. Whereas these rivers here in Calgary and more particularly in Edmonton on the north Saskatchewan, dams were put in to maintain the flow through the winter and allow the population loads that are on these rivers. So it is a… it is worth watching this low flow situation and making sure that the withdrawals that occur do not negatively

impact on the river, and one of the solutions that has been advanced, and Total is one of the ones that has advanced that, is to put some off-stream storage in place, so that when you get to those severe winter conditions, if you have an unusually low flow, you can cut back or stop withdrawing water during those weeks of the winter when it could be a concern.

PMB: Is there any use of brackish ground water on the oil sands?

HYNDMAN: There is in the in-situ operations where they're away from the river and they're using ground water and recycling it. You know, one of the things that results from that is that it takes more energy to use that water and you wind up with salt that has to be disposed, in some cases, disposing of salts in a land fill so, I've never been convinced that that policy is suitably applied in an area where there is abundant surface water and higher quality.

PMB: Management of other wastes and everything comes up, you know, you chop down trees, there's just all kinds of wastes that are generated during the process of keeping one those plants going.

HYNDMAN: Well first of all, you mentioned chopping down trees and the practice in the areas is to harvest the trees that are of merchantable value, either by harvesting them and setting them aside for the forest companies to pick up, or more recently what has been the practice is to integrate the pre-clearing of those sites with the allowable cuts of the forest product firms that have the permits in the area so that you're not cutting down any more trees than you need.

PMB: So you might actually have the forestry company come in and take down the trees.

HYNDMAN: Oh yeah, that's been done, yeah, absolutely. So on a net basis, at least for the harvestable portion of the trees, you're not cutting down any more. As to the rest of it, there's been a shift from burning these things to chopping them up and using them for reclamation, within reclamation soil. Yes, we have to cut down trees to mine the area, but hopefully that's done in the most responsible manner possible.

PMB: Great. Okay, so I'm coming to the end of the questions I have, maybe you have some other things after this, but since you retired from Syncrude, last time you told me, you've worked for Shell's Muskeg River and Scotford Refinery Projects...

HYNDMAN: Scotford Upgrader.

PMB: I'm sorry?

HYNDMAN: Scotford Upgrader. The refinery was already there.

PMB: Oh right, of course, the Scotford Upgrader. Mobil's – now Exxon Mobil's Kearl Project – and the Joslyn Project which is Suncor and Total, I believe. I believe both companies have an interest in that, is that correct?

HYNDMAN: That's correct. Total is the operator of Joslyn, and Suncor is the operator of Fort Hills and there's a mirror image ownership in each of those two projects by Total and Suncor.

PMB: So what are their percentages each?

HYNDMAN: They're both about 37-38 percent.

PMB: So Suncor would have 30 percent of...

HYNDMAN: In one case it's one percent higher on one and the opposite on the other in the case of the operating company.

PMB: So Suncor has 37 percent of Joslyn and Total has roughly 30 percent of...

HYNDMAN: A similar percentage of Fort Hills.

PMB: Now here I would like you take your experience and put everything in perspective for me, 50 words or less, although you've got all the time you need. How have these projects that you've worked on benefited from Syncrude's experience, that's my first question. And second, to what extent have there been advances that have nothing to do with Syncrude. And then the third thing is, based on what you've seen over 40 years or so in the oil sands, how do you think it's going to continue to evolve?

HYNDMAN: Good question. Well your first question was how have the other operators benefited from Syncrude's work. Well, I guess you could start from the beginning and say that those pilot operations that Cities Service Athabasca overtook in '59 to '63, it really did set the stage for the pattern of commercial development that took place in the 60s and 70s by Great Canadian Oil Sands and Syncrude, so that for starters. And you could interview somebody else who has more thoroughly reviewed the records of those operations to see how the transition was made from that work to the commercial templates of the first commercial plans.

Since then, and one of my earlier jobs after I came out of operations in the early 80s and went down and took on Syncrude's research development and growth projects task, was to set out what the objectives were for improving the economic efficiency of the oil sands operations. We did install the first resid hydrocracking upgrader. The LC Fining unit at Syncrude went in, came on stream in '88, so that predated the Husky upgrader in Lloydminster and it certainly predated the Shell upgrader at Scotford which used similar technology and now the Northwest Upgrader that's being built is also based on that technology. In that case we were working with world technology and working hand-in-glove with the licensors in that technology.

So that's on the upgrading end, but one of the obvious things that I came to when I went down and took on that R&D organization, is that in the heavy oil upgrading area, that's a world technology where we want to adapt and do the best we can and utilize, maybe promote some advancement, whereas many aspects of the mining and extraction of oil sands are unique to the Alberta scene, so

that if we were going to make headway, we had to do a lot more of that on our own, but again, where you can, work with world vendors. So, we set out some goals for energy intensity of the extraction process for material handling efficiency of the mining and extraction oil recovery, you know, reducing the losses of oil to tailings and we attacked that suite of benefits that we were seeking as a group because some of them worked with each other.

So some of the early things that were identified is that the bucket-wheel operations weren't particularly efficient from a number of standpoints. These are big machines, they had a relatively low reliability and their output was sinusoidal because of the way the bucket-wheel machine slue through the deposit in the case of an excavator or the spoil pile in the case of a reclaimer. The output is uneven. That doesn't allow for good utilization of conveying systems and it certainly didn't allow for integration into a consistent slurry which is the first step of extraction and which we wanted to move more about into the mines, so we wanted to deal with that.

Secondly, a lot of wear in those, leading to that lack of higher reliability, you know, we knew that some of the shovels, the electric cable shovels and hydraulic shovels, diesel driven hydraulics, had better breakout forces that could dig the oil sand more effectively than those machines. But what we needed was something that would take the output of that, which in the case of a shovel, a big scoop full of oil sand or a truckload, we had to have something that would turn it into a continuous stream. So one of the earliest things we did, we brought in a Stamler Feeder-Breaker and I can't remember the exact capacity but it was less than 2000 tonnes an hour, and bear in mind the machines we have up there today are 10, 12 tonnes an hour, so we brought that in, and it was a prototype to test the method for our application but it was also the biggest machine of that type that had been built to date, so we worked on that and then we, you know I won't give you all the detail, because that would take a long time so it was bringing the truck and shovel operations into the oil sands, working toward how to slurry the oil sands out into the mine and combine the function of moving that oil sand into the separation plant, while at the same time, conditioning the oil sand in the pipeline in replacement for this big rotating drum that we had in the first incarnation in that.

So the other thing that was necessary to accomplish that was to drive the temperature of the process down, so started to work on lower energy, lower temperature, extraction to integrate with that, that work was all sort of done through the 80s and into the 90s and I guess you could say we kind of put everything together that we knew, through that work when we built the Aurora Mine which was the last project I worked on at Syncrude, and in that case we had single train operations at 8500 tonnes an hour – still the biggest today and the most efficient material handling systems that we have up there in the oil sands. So how much are you doing on your own and how much are you relying on world knowledge and vendors? Some of both, you have to work with everything you can get your hands on and if there's nothing available, you figure it out yourself.

PMB: To what extent have the later plants, the CNRL and the Shell, and the others that are now functioning, operating, to what extent did they take your technology, Syncrude's technology directly or did they just try to replicate it?

HYNDMAN: Well in the case of both those firms, since you mention it, they bought the information from Syncrude.

PMB: Oh good. Another source of profit.

HYNDMAN: Well, we're off-setting some heavy R&D expenditures they've had over the years, yes.

PMB: Okay, so the companies are sharing that technology for a price.

HYNDMAN: Well not as effectively today as it has been from time-to-time, but it has been done, and the other thing is just the general knowledge of the people, the contracting firms and the industry does get elevated so that you couldn't avoid benefiting from the mistakes and successes of the Suncors and Syncrudes as succeeding operations come along.

PMB: Is there anything out there in the other projects that you've been working on that really is a surprise to you, just...somebody came up with an idea that was so astonishing, and nobody had thought about it in the older days?

HYNDMAN: I can't think of anything that we haven't thought of! But that doesn't mean that there aren't better things being done. There are better things being done. But the other thing I would say is there's plenty more good stuff to do. Even with our current knowledge base I think you could make another step improvement and the people engaged in the industry now are learning more. One of the challenges of course, in the industry today, is that the level of activity has spread the experience pretty thin across the industry and in that environment it's harder to do things well if you don't have the depth of experience pool. Some of the people working on new things today don't have the benefit of knowing what has already been done and what's already been looked at, and accept it or reject it.

PMB: How do you see the mining industry developing from here on, how will things be in 20 years?

HYNDMAN: In 20 years we will have passed through the peak of mining and oil sands.

PMB: Continue. That's a very interesting idea.

HYNDMAN: Well the sites are all developed and in many cases, as these new projects come along they deal with a particular lease and they make plans to mine it at a rate where the whole thing will be mined out 25, 35, 40 years, so look at the number of years that we're into each of these projects, bear in mind that the best sites have all been built or approved to be built or are building and they will be well past halfway through their 35-40 year cycles, so that by 2020, we will be more and more relying on in-situ projects for supplying bitumen out of that resource, because although it's less well developed, that is the bigger part of the resource.

PMB: So the mining, because I believe the minable areas represent about 15 percent, isn't that about right?

HYNDMAN: That's correct. It could be more than that, 15 or 20 percent of what people think they can recover from the total resource, that sort of thing.

PMB: So, in a very short period of time then, the development is really going to be in the SAGD and in the in-situ part of the business?

HYNDMAN: Well it is, to some extent that's taking place today, there's a lot of SAGD projects, the challenge for the SAGD operations is to get their energy efficiency in line, they talk about it in terms of steam to oil ratio which is a measure of how much energy you have to put into the formation to get a barrel of oil out. There's a few of them that are operating in their target ratios, of maybe two to one steam to oil ratio, others are fortunate that the price of gas is depressed right now and they can afford to operate because they're at higher energy efficiency, so I think the big challenge in the in-situ business, currently dominated by steam-assisted gravity drainage, is to get that energy intensity down on how much they have to put in to get a barrel of oil out. The mining is a big surface, rough and ready operation, but it gets very good recovery and it is geologically dependent but not so geologically dependent as the SAGD operations are.

PMB: Well you've exhausted me. That was really good. Anything you'd like to add?

HYNDMAN: Well I think as someone who came into this industry at its infancy and was able to, I've been able to work on the original Syncrude Project from conception through to operation and then had the responsibility for operating the upgrading portion of it, and then gone on to work on expansions at Syncrude and other projects after that. It's a great industry and it certainly has been a great industry for someone who was able to get in on the ground floor but there's a lot of great people in this industry – very enjoyable working relationships over the years. It's challenging but that's what makes it a lot of fun.

PMB: When are you really going to retire?

HYNDMAN: Again?

PMB: Yeah, next time.

HYNDMAN: Oh I don't know, we'll see. Some days on a Monday morning, looks like the fishing might be pretty good, but I somehow still climb on the plane and come over to get my feet back in the mud and the sand of the oil sands.

PMB: Well thank you very, very much Al, this has been a pleasure to have the opportunity to interview you.

HYNDMAN: Okay, Peter.

PMB: I much appreciate that.

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HYNDMAN: Peter, I've enjoyed talking with you.

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