ORAL HISTORY PROGRAM

Mark Pearson: 40 Years Advancing the Mining Industry

2025

PREFACE

The following oral history is the result of recorded interviews with Dr. Mark Pearson conducted by Akiko Billings on May 18th, 2023. This interview is part of the AIME Oral History Program.

ABSTRACT

Founder of Liberty Resources, expert in horizontal well technology development, and SPE Distinguished Member, Dr. Mark Pearson has spent 40-plus years advancing the mining industry. Moving from the North Sea to the United States, Pearson began to develop his expertise in hydraulic fracking and horizontal well technology. Pearson made a name for himself in high-permeability fracturing and spent 12 years with ARCO before moving on to become a professor at the Colorado School of Mines and a CEO. Moving on to the Bakken, Pearson struck success and began the Liberty Companies. Pearson set out in his career with intention, holding true to the mission of SPE to disseminate technology. Pearson's career-long involvement with SPE, starting up new initiatives and leading technical conferences, has made him a key contributor to the opportunities SPE will provide to future generations of mining engineers.

Readers are asked to bear in mind that they are reading a transcript of the spoken word, rather than written prose. The following transcript has been reviewed, edited, and approved by the narrator.

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00:00:15 Introduction

Billings:

I'm here at the offices of Liberty Resources on May 18th, 2023, to interview Dr. C. Mark Pearson, who is the company's founder, President, and Chief Executive Officer. This is Akiko Billings, Operations Efficiency Engineer with Liberty Energy**.**

00:00:37 Founder of Liberty Resources

Billings:

Mark, so we get the record straight up front, you've been involved in starting a number of companies with the Liberty name, but your day job is running Liberty Resources. Can you provide some clarity as to what Liberty Resources does?

Pearson:

Sure. Liberty Resources is an independent company backed by private equity investors, and we operate in the Bakken of North Dakota. We've also operated in the Powder River Basin in Wyoming. We currently operate about 15,000 barrels of oil equivalent per day of production, and we currently are running a one-rig continuous drilling program.

Billings:

And Liberty Energy?

Pearson:

Well, that's the company that you work for; it used to be known as Liberty Oilfield Services. In 2011, we found that it was easier to start a frack pumping service company to frack our wells than it was to actually get a frack date from the established pumping service companies at that time. And obviously, that's a public company now that you work for and with, I believe, over 5000 employees.

00:01:51 Camborne School of Mines – How My Interest in Rocks Turned into Mining Engineering

Billings:

Okay. I'm glad we got that straight. Now, tell me, where are you from originally, and how did you get excited about the subsurface rock below?

Pearson:

Well, originally, I'm from the UK. You can most likely tell from the accent a little bit. It's hard to lose that, even though I've been here for over 40 years. When I was in high school, I really liked the sciences. So, in 9th and 10th grade, when you get in the UK system, you get to choose your option subjects. I chose physics, chemistry, biology, and geography because I just really was interested in rocks. And how did this earth that we all live on, how did it come about, and how did it get formed? It just seemed fascinating to

me to go do it. So, in 11th and 12th grade, in the UK system, when you specialize in kind of doing your freshman year type studies, I chose physics and math for the engineering, and I chose geography because of my interest in rocks.

Billings:

And from there?

Pearson:

Well, from there, I enrolled to study mining engineering at a school called the Camborne School of Mines. It's a small specialist mining engineering school located in Southwest England, 180 years old. Originally, it grew up to service the local tin industry. It's now part of the University of Exeter, which is the preeminent university in Southwest England and a top 20-rated university in the UK.

Billings:

Now I know we'll get to the other CSM, as in Colorado School of Mines, a little later, but tell me some more about your studies at Camborne and where you thought you were going after you graduated.

Pearson:

Well, when I was in Camborne, I really enjoyed my undergraduate studies. It was really kind of the application of engineering and a broad scope of engineering to rocks and whether it was from mining or whether it was for stability and slope stability, or underground stability. I just found it really interesting, and I got the opportunity to go do intern work, work in the tin mines in Cornwall one summer, and another summer to go to South Africa and work at 10,000-foot depth in the gold mines on the far west Witwatersrand. So I just found it very interesting at that time.

00:04:24 Going 10,000 Feet Underground – Searching to Apply What I'd Learned in University

Billings:

We're often dealing with oil and gas formations that are 10,000 feet deep. But not many of us have been underground, 10,000 feet, to actually look and work with the rocks at that depth and stress. Now, you mentioned grad school. What was that about, and why weren't you looking to go straight to grad school following your undergraduate studies?

Pearson:

Well, I graduated with what's called a first-class honors degree in the UK with my Bachelor of Science. That gave me an automatic opportunity to go to grad school, but I was really interested in trying to understand how we applied what I'd learned at school. So, I thought through what I wanted to do in my career and in my management class. Our professor encouraged us to be intentional about our careers and the steps that we take in our careers. So, what I thought from my first two steps is that I should go out to industry. Go and learn how to be a mining engineer, and then maybe come back to grad school for a few years as my second step in my career.

Billings:

And what were your goals?

Pearson:

Well, you know, as part of our career planning process, our professor encouraged us to think broadly. Unfortunately, I really didn't. When I teach this or give classes about planning your career, I try to get people to think outside the box. Maybe think about running a surf shack in Bali or something fun. In my case, it was somewhat boring. It was to be an executive of a mining or an earth resource company, potentially to go on the consultant side, be a partner in a consulting geotechnical consulting company, or something like that. Or thirdly, was to be a professor and to do some consulting work for industry part-time, while I was also teaching and doing research work.

00:06:28 Going on to Grad School – Learning How to Turn Engineering Theory into a Real Application

Billings:

Now, we'll come back to this theme about planning your career later, but how come you ended up going straight on to grad school?

Pearson:

Well, I wanted to understand operations and understand how to apply the engineering knowledge that I'd obtained. So my first thoughts were to go to industry. To go and spend 2 or 3 years, perhaps as a junior engineer working in a mining operation. The prior year, I'd received a number of job offers from Australia. It all sounded very exciting to me that I was going to go to Australia to be a mining engineer. But in 1977, which was the year I graduated, the Australian government banned the export of uranium, threw 25,000 miners out of work, and I couldn't get a work permit. So, as I was thinking through what to do, the opportunity arose to go straight on to grad school, so I decided, why not? Let's just switch it around and go straight to grad school.

Billings:

So, how did your PhD thesis develop, and who influenced you?

Pearson:

Well, without a doubt. My biggest influence was my rock mechanics professor, Dr. Tony Batchelor. Tony just recently passed, but was just a great inspiration to me and many other students that he mentored. Tony just had this ability to show us engineering theory and to take something like stress through the rock, calculating stresses as a function of distance from a mined opening, and then showing you how to turn that into a real application of how did you engineer a structure, or how did you engineer a slope stability in order to be stable? It just really captivated me, this interest of rocks, but also how to actually engineer principles and how to engineer structures associated with rocks.

00:08:32 My PhD Thesis – Hands-on Well Construction & Hydraulic Fracturing Experience

Pearson:

So, in the UK system, in your senior year, you have to do an undergraduate thesis. Mine had been how to pump some hydraulic fracture jobs on some 100-foot deep boreholes. There was a research opportunity to work at taking that technology of trying to have a geothermal injection and production system to 1,000 foot deep in granite rocks. I decided to pursue that and look at different stimulation techniques as part of my PhD thesis.

Billings:

That sounds fascinating. And you have an interesting photo of one of your first stimulations.

Pearson:

Yes. This photo is of one of the original first near wellbore stimulations. So my thesis was about trying to use small explosive initiations in an open hole granite section in order to crack the rock and overcome the tensile stress or tensile strength of the rock prior to hydraulic extension of the fracks into the natural fracture system. And the reason is that if you just started hydraulic fracturing, the pressure-time curve is so slow that all you really end up doing is just opening the natural fractures that already exist. So it was looking at near wellbore frack initiation in order to create a geothermal heat exchange reservoir.

Billings:

I hear you are pretty hands-on on the well construction.

Pearson:

Yes. You know, when you're a grad student, you don't have a lot of hands. The project was to drill four thousand-foot-deep vertical wells, frack them with different frack techniques, connect them together, and have one injection well and three recovery wells. So, I had to oversee the drilling program. I had to design a cementing truck to cement the surface casing of the wells, and then ultimately go and run the frack treatments, and ultimately, the theory of doing all of that. That became the subject of my PhD thesis.

Billings:

You also did your first true hydraulic fracturing work there.

Pearson:

Yes. So as part of the geothermal reservoir characterization, we had the opportunity to bring frack skids from the North Sea onshore. As I recall, there were frack skids from B.J. Hughes and Halliburton that we brought onshore to do our hydraulic frack work and hydraulic circulation work. We actually ran tests up to two weeks continuously of injection and circulation, and looking at the different reservoir parameters and the heat exchange in the granite rock. So it was all very exciting, particularly for a young graduate student.

00:11:24 How a Visit Became 40 Years in the US – Moving from the UK & Joining Gulf Oil

Billings:

You also took your first visit to the US?

Pearson:

Yes. In 1979, I was given the opportunity to come to the US Hot, Dry Rock Geothermal Program that was being run out of Los Alamos labs in New Mexico. Their test site was just a little bit north of Los Alamos at a place called Fenton Hill. I had the opportunity to go there and be on site when they were doing some of their initial frack work with the old Dowell Company.

Billings:

How successful did your own research program turn out to be?

Pearson:

Well, I guess it was pretty successful. We achieved the objective of a geothermal heat exchange reservoir of connecting the wells together hydraulically through the reservoir. And out of that, we got funding for a much deeper program to drill two 5,000-foot-deep wells, which were slant hole wells, that would then be stimulated and a geothermal reservoir created. I agreed to stay on for a year into that program as the lead of the geotechnical group, or the reservoir group, while we put that together. But I'd already set my heart, at that point, of going to the oil and gas industry. Having gotten into doing frac operations with my graduate research work, I was really, really inspired to come over to the US. What I thought would perhaps be for 5 to 10 years before returning to the North Sea, but that was 40 years ago, and I'm still here, and I don't think I'm ever going back.

Billings:

From there, you joined Gulf Oil?

Pearson:

Yes, I started with Gulf and actually started in Canada with Gulf Canada, working in Calgary. I worked at Tar Sands Huff and Puff Pilot. Basically, we were trying to mobilize the in-situ bitumen by doing huff and puff steam injection and fracturing of the rocks. So I joined Gulf in the summer of 1981, and as I got into that program work, spent most of the first quarter of 1982 actually on location in Fort McMurray, working frack, steam, frack, huff, and puff injection cycles. So again, pretty exciting, very different obviously, than going from a temperate climate in Europe to being -40°F in northern Alberta. But very exciting to work with Gulf.

00:14:06 My First Frack Job – Assessing Horizontal Wells for the Future of the Oil Industry

Billings:

So tell me about your first frack job. I hear it was quite a shock for you.

Pearson:

Yes, it really was. I can say I transferred down to Pittsburgh to work for Gulf Oil, US. My first frack job that I attended, conventional frack job, was in 1982, in the Kurten Oil Field in Bryan, Texas. I think you have to recognize when you're in grad school, you know, we had been running our fracs with a lot of on-site monitoring. We had three-dimensional accelerometers connected to the granite rock at the surface. So, we were actually frac mapping 40 years ago of where the fracs were generating and where they were connecting up. We had fiber optic cables connecting our on-site data collection to our computers for analysis. When I got to my first oilfield frac job in the Kurten Field, we had a Martin Decker pressure gauge that was just a big gauge outside of the frac van that you looked at on the surface. We had a turbine meter that would give you the rate of your clean gel that was being pumped, and we had a densitometer to give us density. And those three channels went to a little analog strip recorder that gave you a little six-inch wide paper strip of the frac job, and that was it. So it was quite a shock to come and work in the oil field and to look at what conventional fracking was 40 years ago.

Billings:

Certainly, a lot different than our frac monitoring work going on location today. What other work did you do working for Gulf?

Pearson:

Well, when I was at Gulf, my department had originally been hired to work on an oil shale project in Colorado, and that project got shut down as prices dropped in the 80s on oil. I ended up working conventional oil opportunities, and my department got transferred from Pittsburgh to Houston. So I moved to Houston, and I spent a year working a lot of West Texas conventional vertical well fracking. I also got to work on some special projects. One of the projects was an assessment of horizontal wells for the Cotton Valley formation in East Texas. It was interesting the reservoir simulation work showed that if we could drill a horizontal well and maybe put 3 to 5 fracs on it, that would be a great production increase and a great increase in recovery if we could do it technically. But we didn't know how we could cement the wells. We didn't know how we'd be able to perforate it and get the fracs to actually turn from longitudinal to orthogonal fracs. So there were a lot of unknowns, but it was kind of exciting, even 40 years ago, to dream about what horizontal wells and what multi-stage fracs could do for the industry.

00:17:25 Joining the Technology Research Center at Atlantic Richfield Company

Billings:

In 1984, Chevron announced they had bought Gulf. How did that affect you?

Pearson:

It was really interesting as a young engineer, and suddenly I've been working for Gulf for three years, and suddenly find out that Chevron had bought Gulf. But they had some antitrust issues that they couldn't relocate people. They couldn't tell people whether they even had a job. So my whole department, from the division manager to the lowest engineer like myself or a technician, everyone went job hunting, and everyone shared notes about who was hiring and what was going on. So, in 1984, I looked around, looked at various opportunities. One of the groups that had really inspired me was

Atlantic Richfield Company, or ARCO, as they were known. ARCO had started taking horizontal drilling to the field and had run a number of short-radius horizontal wells in fractured limestone formations like the Empire Abo Field in New Mexico. I found an opportunity to get hired into their drilling and completions research group in Plano, Texas.

Billings:

You spent seven years in the technology center in Plano, Texas. What was your role there?

Pearson:

Well, my official title was staff research engineer. We were really given a lot of broad scope in terms of finding opportunities both to push technology and develop technology, and to then go work with our operating districts on how to apply that technology. One of the ones that I got into straight away was just on-site monitoring of frac jobs. It was just so rudimentary what most of the industry was doing that we built some trucks and we built some skids. Instrumentation skids, one on the clean side of the blender and one that went on the dirty side of the blender, where we measured in real-time. All the fluid properties put flow meters into all the additive streams and then brought it back to our own computer van. I had a manager who was very innovative. He came up with the idea of naming it the SMART Van and the SMART Project, which was a great acronym for stimulation monitoring and analysis research truck. And so I kind of built this truck that would go out to the operating districts and actually monitor and measure, and then model with our frac models what was going on location. Apart from that, I also did a lot of district consulting work throughout Texas, Mid-Continent, and other places. It was an exciting period, and it was an exciting period for the company in particular because while most of the conventional industry was dying, Alaska was growing. The 1980s was really the decade of Alaska growth, and ARCO was in a position where they were investing a lot of capital and looking at how to maximize the productivity out of their Alaska resources.

Billings:

One of your group's projects was drilling the industry's first medium-radius horizontal well?

Pearson:

Yes, I'd been hired into the drilling and completions research group, and the group was led by a gentleman by the name of Frank Schuh. And Frank is widely regarded as the father of modern horizontal drilling. One of Frank's projects was to take directional tools that had been employed in the Gulf Coast and bring them onshore. He went and drilled a 20-degree per 100-foot medium radius well into the Austin Chalk, just outside of Dallas, in a place called Rockwall, Texas, as a demonstration of using that technology to land a horizontal well. I believe it was a 1500-foot lateral in the Austin Chalk that was drilled as the industry's first medium-radius horizontal well.

00:21:44 Horizontal Drilling Technology – A Great Technical Success, but an Economic Failure

Billings:

And after that, the tech team took the horizontal drilling technology to West Texas.

Pearson:

Yes. In 1987, we decided to take the horizontal drilling and combine that with fracturing, and took it to West Texas to go and run three wells as a test pilot program on fracked horizontal wells. Now, these were all open-hole laterals, so they were single-stage kind of pump and pray fracs that we tried to use chemical diversion on. But about 2600-foot laterals. What's interesting to think about is that this work was going on in the mid to late 1980s. I think most engineers in the Delaware and the Permian today would think that horizontal drilling started ten years ago. That's not the case. You know, it started 35 years ago now, back with ARCO, with Mobil, and a couple of other companies that started using horizontal drilling. So it's very exciting. The photo behind me is actually the first well that I was involved with in 1987, which was a large frac treatment of a single 2600-foot lateral.

Billings:

And what was the result of these wells?

Pearson:

Well, it was a great technical success. We did everything that we expected to do. Unfortunately, we didn't get the stimulation benefit. I think the well increased about 30 or 40 barrels per month in production, as it was very minimal, just 1 or 2 barrels a day of additional production that came out of the well. It was deemed an economic failure and something that the company decided not to pursue.

00:23:39 One Paper a Year for SPE Conferences – A Chance to Discuss My Work Among My Peers

Billings:

Now, you also started writing papers for SPE conferences in your early ARCO days?

Pearson:

Yes, in 1986. I remember well my first presentation paper was a paper on spectral gamma ray logging. We were using spectral logging to work out if ray tracer material was inside the wellbore or outside the wellbore, and found that by using a spectral log instead of a total log, we could determine the actual depth of investigation and consequently measure fracture height a lot more accurately. So my first paper was in New Orleans in ATCE in 1986, and a year later, I gave a paper on our SMART project on the on-site monitoring. I think perhaps my favorite paper, at the time, was a 1988 paper in Dallas that I gave on Cotton Valley frac work that I was involved every other Thursday, pumping a massive hydraulic frac in the Cotton Valley in East Texas for about an 18-month period in 1985 and 86, where we take our frac crew and our frac equipment from location to location. And every other Thursday, we would pump a 3-million-pound frac job. But by using fracture pressure analysis, we were able to optimize the designs, get longer half-lengths for our fracs, and consequently, more production out of the wells. It was kind of exciting to be involved in a project where we took the technology, applied it, had good onsite monitoring of what we were doing, and consequently changed our designs and got more production out of the wells.

Billings:

So why were you wanting to publish those early papers, and what was the benefit to you?

Pearson:

Well, first, I had thought that I might be a professor one day. So, recognizing that, I thought it would be a good idea to have some publications and to have my work out in the public domain. But also, what I quickly realized is that there's some real benefit when you open your work up to critique and commentary from your industry peers. Just because your company sees it one way or you see something one way, you may be missing some of the analysis. You might be missing what comes out of that. And so, there was a great benefit just to be able to discuss my work in an open public forum. Then the other point, and I have to admit, was maybe somewhat selfish. I realized pretty early on that if I wasn't going to publish a paper or go to a conference and present, I was perhaps going to go to a conference once each 3 or 4 years. If I wanted to go to the conference and go to the annual technical conference every year, there had to be a justification why the company would send me. Giving a paper is as good a justification as anything else. So, I pretty quickly got into the mode of writing one paper a year through my career.

00:26:57 A Name in High Permeability Fracturing – A New Application of 40-Year-Old Technology

Billings:

So, what other geographic areas did you work while based in Plano?

Pearson:

Well, you know, the company had operations throughout the US. I worked throughout Texas, East Texas, as I mentioned, some in West Texas, and South Texas Mid-Continent. I got to do a little bit of work in the North Sea out of the UK office, which was nice to get back to the UK and actually work out of that office on a couple of projects. I also did some work in Southeast Asia, and then secondarily Alaska. And since Alaska was two-thirds of the liquids production of the company, I started working more and more in Alaska.

Billings:

I hear you made quite a name for yourself, developing moderate and high permeability techniques in the late 80s and early 90s.

Pearson:

Yeah, it was an interesting time that in the 1970s and early 80s, the leading edge of hydraulic fracturing was really in tight gas rocks. A technique that is called the MHF, the massive hydraulic fracture in a vertical well, was kind of the leading edge of how do you do the best MHF work. Pumping 3 million pounds, maybe there are some individual jobs that were as much as 7 or 8 million pounds that were pumped in South Texas. That was the leading edge of the industry. No one had really looked at fracking of high-perm formations. A lot of the focus had been on folds of increase. If you look back at a lot of the early literature, you look at the benefit of fracking is that you can get a threefold, or fivefold, a sevenfold increase in production out of a low-permeability rock. And that's very true. But if you run the simulation of the reservoir simulation on a moderate perm, maybe 100 millidarcy rock or a 500 millidarcy rock, you

realize that you might increase fracturing, might increase the production one X, maybe by 50%, maybe two X if you're lucky.

Pearson:

But when you look at the absolute value, instead of taking a ten-barrel-a-day well and making a 50-barrel-a-day well, you take a 1500 barrel-a-day well and make it a 3000 barrel-a-day well. So the absolute impact of moderate and high permeability fracturing was much greater on a per-well basis compared to the low permeability fracturing. In the late 80s and 1990s, as we developed moderate and high-perm fracturing for Alaska for the Kuparuk field, part of the Prudhoe Bay field. That technology then went on to frac packs in the Gulf of Mexico. What we found is that our designs were really driven by conductivity. I remember at one time giving a talk about the three most important factors for frac design and high-perm formations. Conductivity, conductivity, and conductivity. Because if you didn't have that conductivity, you could pump as big a frac as you liked, but you weren't getting any more production than what you would get out of a small frac. So, it was an exciting time to be working on new technology and a new application of this 40-year-old technology of hydraulic fracturing.

00:30:28 Optimizing Fracking in Alaska – Learning & Applying My Core Expertise in Wells

Billings:

So you went up to Alaska's North Slope to frack?

Pearson:

Yes. You know, today we called them DFITs, diagnostic fracture injection tests. In the old days, we used to call them data fracs. Where we basically pump a small mini frac, or data frack, into the formation. And then we'd sometimes just shut in the well. Sometimes, we'd flow it back at a low constant rate, and then we'd do the fracture diagnostics or the pressure transient diagnostics to work out the leak-off coefficient, to work off the fracture closure, and design our frack treatments. So in the spring of 1987, I went up to Alaska with a bunch of equipment from my SMART truck. And I remember an old Hewlett-Packard, I think it was called a Series III, kind of suitcase computer, and went up to go run a whole series of data fracs. What should have taken us maybe two weeks to run ended up, because of weather conditions, it took us ten weeks to run. We had -40-degree ambient temperature a lot of the time. I remember at one time fracking with -100 wind chill. So it was quite remote and quite extreme to be fracking up there. Nevertheless, we kind of took the diagnostics technology that had been developed for the conventional low-permeability fracking and started working out how to apply that to Alaska and to high-permeability formations.

Billings:

From there, you worked at optimizing the fracs?

Pearson:

Yes, we increased fracture conductivity, and you started increasing the size of the fracs. What we found is that we were able to take the wells from having positive skin after drilling to two skins of -5 to -6. That would generate flow efficiencies of 250 to 300%. So we were getting two and a half to three X what an

undamaged flow rate would be out of the wells. And that was pretty significant when you were dealing with wells that you're measuring thousands of barrels a day of production coming out of the wells. So it was very exciting. I did learn one thing. I had a paper in 1992, the optimal fracturing of high-perm formations, and one of my managers pointed out to me that might be optimum for that period of where we were working it. And sure enough, as technology moves, the optimization changes, too. And so that was the last time I remember actually using the term optimization or optimal frac in any of my papers.

Billings:

So, from Plano, you moved up to Alaska full-time?

Pearson:

Yeah, I had an opportunity in 1989 to move up to Alaska to join the Kuparuk engineering group, to work the Kuparuk field on drill site developments. And it was really exciting because every pad, we would drill with directional technology; we would drill 16 to 30 wells off the pad and a Kuparuk field. Every well was fracked. It was a great combination of my fracturing background, but really learning the whole project feasibility and all the project steps and disciplines that go into well development. And so it was a very exciting time of both learning and still applying my core expertise in well completions.

Billings:

And eventually into management.

Pearson:

Yes, I had the opportunity to move into engineering management there, but what I realized that technology was really my differentiating contributing factor. So I still kept chairmanship of a couple of our working groups, of technology groups. The two I chose to spend my time on were our company-wide horizontal well group and also our fracture technology group. I look back now, 25 years later, it was somewhat fortuitous to both be in management and also still be very involved in the leading edge of fracturing technology and horizontal technology, and ultimately putting those two technologies together.

00:35:05 SPE Distinguished Lecturer on 30 Years of Horizontal Well Technology Development

Billings:

I know that in 2012 and 2013, you were an SPE distinguished lecturer on the 30 years of horizontal well technology development. Tell me more about your early Alaska horizontal wells and what caused you to do this work.

Pearson:

Well, my early Gulf work, I had got involved in horizontal wells from a theoretical standpoint, from a modeling standpoint at ARCO. I'd been working with Frank Schuh's group as he developed the medium radius horizontal well. We tested it unsuccessfully in West Texas. But in 1992, the Society of Petroleum Engineers had a forum on horizontal well completion technology. The forum format is very interesting at

SPE. They gather a group of 50 to 70 industry experts or knowledgeable people in the industry, and we discuss the state of the technology and think through where could that technology be in 20 years' time. So, in 1992, SPE convened a forum on horizontal well completion technology. In fact, it was in Breckenridge here in Colorado, and I came down from Alaska and participated in that. We discussed some work that was going on in the North Sea at the time, in the Dan Field, in the Danish North Sea, and we discussed some of the other earlier project work in the US. I went back to Alaska, challenged that maybe there really was an opportunity for us to use horizontal wells in Alaska. I got approval for a five-well pilot program in the Kuparuk field, where we were going to drill 2600-foot lateral wells and try to replace two vertical wells with a single horizontal well that we'd stimulate by different techniques.

I look back at it now, and it seems somewhat rudimentary, but we did; I think two of the wells were single-stage fracs, and two of them were two-stage fracs. One at the toe, one at the heel, to kind of replicate the deviated wells. And one of them, we actually did a three-stage frac. But I think what you have to realize is that there was no technology for plugs. There was no plug technology that would withstand the differential pressures that are involved, downhole and fracturing. So we were really limited back then, 25 years ago, by the jewelry or the lack of hardware that we could run the multi-stage fracs. But it was an exciting period. Again, the projects were good; the wells did well, but they weren't better than drilling two conventional wells. So, the company didn't pursue it further at that time with just single-stage and dual-stage fracs. Although I have to say I look back at the production results now, and each of those wells have cum'd anywhere from 3 to 6 million barrels of oil. So when you look back at over the course of time, really very successful projects.

Billings:

Why was that so hard to engineer, and why not pump more stages?

Pearson:

Well, as I mentioned just now, there wasn't the downhole jewelry that we have now, the plugs that can withstand the differential pressures. I remember when we were trying to design it, I think the best packer technology at the time could withstand a 3000 PSI differential pressure. Plugs that we pump today for our multi-stage horizontal fracs are 8000 to 10,000 PSI-rated differential pressures. So, we just didn't have that technology. In fact, how we pumped our two-stage and three-stage fracs was to use coiled tubing to set sand plugs over the first wells. It was still very exciting, and we were breaking new ground. What was interesting is that I remember presenting an SPE paper on it here in Denver at the 1996 annual Technical Conference. We presented the results of the five wells and what we did. I think, gosh, there might have been 10 or 20 people in the audience. It just didn't seem to have a lot of interest about horizontal wells and fracking of horizontal wells back 25 years ago.

00:39:54 Technology Awards & 12 Years with ARCO – Celebrating My Technical Achievements

Billings:

At ARCO, you received a number of outstanding technical achievement awards. Tell me more about that.

Pearson:

ARCO was a company that really prided itself, and it really encouraged us to technically take risks. To take steps to try and do things in a better manner and to develop more resources to develop higher value for the company in applying technology. They celebrated one technology project in each of their business units by looking at the impact of that technology on the corporation's bottom line. The lead of the project team in each of the companies was then invited to Los Angeles to the corporate headquarters. I remember going up to the 51st floor of the ARCO tower, meeting the Chairman, talking about my project and my team's project, because it wasn't just me. I was just fortunate to be leading it. And I was fortunate enough that I received three of these technology awards for the impact of the technical work that the team that I was on had made to the corporation's bottom line. It was a nice way that they celebrated it as well. So very proud of those awards from my time at ARCO.

Billings:

So, after nearly 12 years with ARCO, you left all of a sudden?

Pearson:

Yes, it was a hard decision. It had been such a great company, and I enjoyed my time, but it was just I lived seven years full-time in Alaska, and it was just wearing on me. I had hoped to be up there for five years and maybe move on and do something different. After seven years, it was just wearing on me. The extended cold and the extended darkness, I think, in the wintertime, or the lack of light in the wintertime. I was in an operations management position, working eight days on the North Slope and six days off. I had done that for nearly two years and just decided it was time to do something totally different. That's when I left and came to Colorado School of Mines as a professor in the Petroleum Engineering Department.

00:42:20 A Rewarding Time – Professor at the Colorado School of Mines & CEO at Carbo Ceramics

Billings:

And how was that?

Pearson:

Well, you know, some people in the industry think that it must be a great life being a professor, and it really is. But it's a great life, not because of it being an easy job. It's a great life because you're training young people and young minds. You're giving people an opportunity to participate and contribute in the industry because I went in there, had to write two new undergraduate courses, and also a new graduate program in well stimulation. I also had to raise money for research work that, thankfully, because of my industry contacts, I was able to do. It was a lot of work for not a lot of pay, I can tell you. But it was very, very fulfilling. Just the students that I met and that have gone on to do great things in the industry, to participate, and to give back to others.

Billings:

Well, I know you did a great job because when I went through Mines in 2013, they were still handing out a version of your stimulation manual in the undergraduate senior class. So thank you for that. But you left?

Pearson:

Yes. In the summer of 1997, I had been at Mines for two years. I wasn't looking for anything, but I had three unsolicited job offers. Of course, oil and gas, we're in a cyclical industry. And suddenly, in 1997, the industry got hot again, and I had three unsolicited job offers. I said no to all of them at first, but after some persistence, one company that had recently gone public offered me my first opportunity at an executive position, and I joined a company called Carbo Ceramics. That was a manufacturer of premium proppants, ceramic proppants, and other fracture-related services and technologies, and I decided to move back to the Dallas area to go work with Carbo.

Billings:

And Carbo was going through a lot of growth. That must have been exciting.

Pearson:

Yes, it was. It really was. I got to work a lot of technical projects on fields all around the world on how to optimize completions, how to optimize fracturing. I also got the opportunity to present it to a lot of international SPE sections as part of my job as a VP of Marketing and Technology, originally. I also had oversight of business development, which included building new manufacturing plants both here in the US, in the state of Georgia, but also in China and in Russia. That was kind of an interesting experience because it brought some of my mining background in, since you're processing a mined raw material to manufacture an oilfield product. So it was an exciting time, a lot of work, a lot of travel. But also, a very rewarding time of my career.

00:45:33 Starting My First E&P Company, Golden Energy

Billings:

So after five years as CEO, you left and moved to Colorado to do private equity-backed startups?

Pearson:

Yes. By that time in my career, I had lived in eight cities in 24 years, and I just felt it was about time to get some stability into my life. Plus, my wife and I were pretty avid snowboarders, and you can't do a lot of that in Texas. So we actually both came to Breckenridge, Colorado; originally took three months off. I became a snowboard instructor. It also gives you a little dose of humility when you're earning $13 an hour plus tips, I should mention, compared to an oil field salary. I did that for three months and then came down to Denver to start networking to start my first E&P company.

Billings:

And this E&P company was Golden Energy. What did they do?

Pearson:

Yes. So my first company I started was called Golden Energy, named for Golden, where Colorado School

of Mines is, as you know. And Golden was a tight gas-focused company. We operated in Wyoming. We also had another project, a horizontal drilling project in the Mississippi Lime in Oklahoma. And I say we operated in the Rock Springs Uplift area just outside of Rock Springs, Wyoming.

Billings:

I hear things did not end too well.

Pearson:

No. You know, this is a cyclical business. We know that. But often, when you're working engineering and technology, you perhaps don't understand the financial impacts of that cyclicality in our business. We had the misfortune at Golden of working hard for two years and starting our first drilling program in Wyoming. It was a five-well program, and we spud our first well, the first week of September of 2008. I think most of us know what happened a week later, on September 15th, Lehman Brothers went bankrupt, the global financial crisis occurred, and the wellhead price in Rock Springs went from $6 per 1000 cubic feet to $225 three months later, by the end of the year. So we were spending all of our capital just knowing that our commodity price was going away. Ultimately, our private equity sponsor decided to go from six companies that they had sponsored here in Denver to only one, and with no hedged production. By June 30th of 2009, Golden Energy was shut down, and unfortunately, Maria and I had lost a third of our net worth in that.

00:48:39 Moving on to the Bakken – Producing 2,000 Barrels of Oil A Day

Billings:

So, you closed shop at Golden Energy at the end of June 2009. And what, then?

Pearson:

Well, it was obvious that I needed to go back to working oil and oil prospects. Fortunately, the following week, I recall it was an old ARCO buddy of mine by the name of Scott Wilson; Scott's a VP of engineering at Ryder Scott here in Denver. Scott called me; he had a client who was working in the Bakken and had drilled two wells in a new prospective area called the Central Basin. Unfortunately, those wells hadn't turned out too well. They'd only averaged 150 barrels of oil a day in the first month of production. Scott had been asked to do a reservoir study to look at what was wrong with the reservoir. His conclusion was there was nothing really wrong with the rocks or the reservoir, but maybe there was something to do with the completion. So, I had an opportunity to start a consulting assignment, looking at those wells, looking at offset wells, and looking at some refracture treatments that have been done on offset wells. I pumped my first two refrac treatments using slickwater as the fracturing fluid and then had one third well and designed what is now the first slickwater completion ever pumped in the Bakken, which I pumped in 2009.

Billings:

The painting on your wall is from a photo taken of you running the frac on that?

Pearson:

Well, yes, that was Christmas week 2009. My wife and my son William came up to North Dakota with me to go and run the completion of that well. It took us the whole week to run it. It was very cold. I recall, in fact, it was -35 ambient one day we had to shut down frac operations, it was so cold. But we successfully ran a 15-stage one-mile lateral completion.

Billings:

And when did you know that well was a success?

Pearson:

I remember it well because the first week of January, we got to drill out the well, and I was on location as we were drilling it out. After we drilled it out again, it was still very cold, so I was in my full Arctic gear from my ARCO days working the North Slope. That well flowed back 2,000 barrels of oil its first day of production after drill out. It was an amazing sense of euphoria came over me that I'm here. The lower 48, onshore, US, taking unconventional shale rock, and we got wells producing 2,000 barrels of oil a day. Not that dissimilar to some of our wells on the North Slope of Alaska. It was quite a realization to achieve that.

00:51:47 The Start of the Liberty Companies

Billings:

That well set a lot of things in motion for you.

Pearson:

Yes. I mean, realizing the opportunity and realizing what would be the economic potential there, it really set me going on raising funds for the first Liberty Resources company. We were able to raise $200 million for that company, and in September 2010, closed on our first acquisition for that company. So, yes, it was exciting. That was really 2010, the start of the Liberty companies.

Billings:

But as you raised money, put leasehold together, and started drilling, you had problems getting your wells fracked.

Pearson:

Yes, we'd had a number of different frac companies. You know, the whole Bakken was in a boom. There was over 200 rigs running for five years. I think consistently that frac services were in short supply. I had brought up a number of frac companies into the basin that had not been operating in North Dakota. But for a small company, as soon as they got work, a bigger company would take them on a dedicated frac contract. And found ourselves in 2011 in a situation where we had 14 wells in backlog, and I couldn't even get on the frac calendar for a frac date. I found out about a company that was a frac fabricator in Houston that had just started up. And it was easier to buy a frac fleet and start a frac company than it was to get in the queue and actually get a frac date from an established frac company.

Billings:

I hear you spent a lot of time in North Dakota during this period.

Pearson:

Yes, it was a period of frantic work and not enough people to go and do everything. So, I got a suite at the Candlewood Suites. In fact, it was Suite 408 at the Candlewood Suites next to the old Williston Airport. And we kept that suite for two and a half years as I rotated with our VP of Ops, two weeks on and two weeks off, running our frac and completion operations and our production operations during that period.

Billings:

I know you sold Liberty Resources I and now run Liberty Resources II, but you are still very involved technically in the company.

Pearson:

Yes. One of the advantages of being a small company is that I can also be on our technical teams. I found that very exciting, as we've continued to push completion technology using tools like data analytics for our completion design, as we've totally changed our perforating strategies. We use a technology that we've published on called Extreme Limited Entry in our perforating for the fracs that we're trying to put into the formation. And now, really, part of our EOR [Enhanced Oil Recovery] Team trying to look at—We're about to conduct our third pilot in EOR operations in the Bakken, which I think is very exciting. It is really going to be the next phase of unconventional development because, by our estimates, we're perhaps recovering right now 10 to 14% of the oil in place. So there is a massive target out there for technology, and we've got a team working that. And I say we're about to conduct our third pilot for an EOR huff and puff.

00:55:31 Starting New Initiatives with SPE & Contributing to the Mission to Disseminate Technology

Billings:

In addition to the approximately 60 papers you've written or coauthored and several patents. You've also been very involved with technical committees at SPE, from chairing the editorial committee to chairing numerous technical conference programs. Why be so involved?

Pearson:

Well, it has been great to have such an opportunity with SPE. But, at first, as a young engineer, it was an opportunity to learn from others, to go sit in papers, be part of conferences, learn more about the industry than what I was working on directly myself. It was an opportunity to participate in the discussions, to share ideas, and discuss those with peers who worked at other companies. And as I mentioned earlier, to get feedback on our own work and to maybe view it somewhat differently. Ultimately, as I started working globally to develop a global network, here. SPE International is a global organization. There's an opportunity to collaborate on a global basis, not just regionally or in the US, and

then ultimately to give back, to participate, and to provide opportunities for others to have similar opportunities as myself with SPE.

Billings:

Is there any one activity that you particularly enjoyed or found particularly satisfying?

Pearson:

I think starting new ventures or new opportunities. I was JPT's editorial committee chair at the time when we changed the format of the Journal of Petroleum Technology. We went from just being three technical papers to the summaries of papers with three different subjects and typically three different papers that are covered in a summary format in the Journal. And there was quite a bit of pushback on that. But to me, it was all about the core mission of SPE to disseminate technology, and something that I was happy to be involved in. I've also been involved in starting a number of new conferences. I was the program chair of SPE's first International Arctic Technology Conference. I was fortunate enough to be invited on the committee for the first SPE Hydraulic Fracturing Technology Conference, which I want to say was in 2007, was the first one there. And for the first three International Hydraulic Fracturing Technology conferences held in Muscat, Oman. I'd been the program chair or co-chair for those conferences, and I found that very exciting to be part of new initiatives with SPE.

Billings:

You've received several awards and recognition from SPE. Any one thing that sticks out in particular?

Pearson:

I think a couple of things. One, because it was totally unexpected. In 2005, I was named a distinguished member of SPE. At the time, I was CEO at Carbo Ceramics and was more involved for a couple of years on financial matters and corporate matters, and business development. So, to be recognized as a distinguished member there was a great honor and something I really appreciated. And I think perhaps more importantly, even than that, perhaps in 2018, I was recognized with the SPE Completion Technology and Optimization Award. I think primarily for my role in completions optimization and completions work for horizontal wells.

Billings:

In 1994, you were recognized as the Engineer of the Year in Alaska?

Pearson:

Yes. In both '92 and '94, I was actually named the SPE Engineer of the Year in Alaska, which was a great award. But in 1994, the combined 13 Engineering Societies of Alaska recognized me as the Alaska Engineer of the Year. And it was very prestigious to be so named.

00:59:47 Make an Impact with SPE – Be Excited, Have Passion & Find Your Niche

Billings:

If you were to recommend SPE to a new graduate, what would you tell him or her about it?

Pearson:

Well, there's so much to SPE, but of course, the first thing is just the mission of SPE to disseminate technology. And if you want to be a technical person in our industry, there's no better organization to be involved in. So, an opportunity to learn, to participate, to develop friends, to network together. To help you do a better job in what you're working on and ultimately to contribute to a better society. That's really energy-driven in terms of our standard of living and our developed society.

Billings:

What advice would you have for today's young leaders in the engineering profession?

Pearson:

Well, I think first you've got to be excited. I mean, I was excited by rocks as a teenager and just fascinated by plate tectonics and depositional systems and so on. So I think you've got to have a passion, whatever you want to do in life, have a passion about it, and find what that passion is. It's going to be different for different people. I think first, understand what your passion is, find out where it fits into the whole energy business and the oil and gas business, and then find a company that needs that passion and needs that understanding and that technology that you're involved with. Then, I think a real important element in our industry is that there's very little that we as individuals do. It's teams that make our industry work. Find a team that you plug into that's going to make a difference, that wants to make a difference. And quite frankly, because it's also an expensive industry and it's a capital-intensive industry, if you're on the E&P side, make sure that you're with a company that has the finances to actually fund the work that they're going out to go do. That's so important, particularly in a cyclical industry. There are so many opportunities out there. But definitely, I would say find your niche, find where you're going to make an impact.

01:02:13 Career Mentoring – Be Intentional About Planning Your Career

Billings:

Tell me more about some of the career mentoring you've done.

Pearson:

Yes. It's been interesting to develop this concept that I was taught early on by my management professor: trying to be intentional about your career. So I've had the opportunity to mentor a few groups here in Denver at School of Mines, Colorado Oil and Gas Association, and the Denver Petroleum Club, to talk about how do you become intentional about planning your career and conceptually go back to what's your objective. Where you might be at age 50 or thereabouts, and what are the steps that you need to take in terms of developing the experience along the way to make it to what could be your dream job or later in your career? That's something which I've kind of followed in my own career, and it's really helped me not just in jobs that I've taken and decisions that I've made there, but also decisions that I've made not to take a job, that it wasn't the right thing. Sometimes, that's even involved turning

down a promotion because it ultimately was going to lead to a dead end, I felt, and wasn't going to be where my heart was and where I wanted to really participate in the industry.

Billings:

Even charted your own career?

Pearson:

Yes. Here's a plot of the chart of my own career, and I've broken it down to different steps along the way, and also highlighted the jobs that I didn't take for a number of reasons. Sometimes, those decisions were easy, and sometimes, they were relatively hard, I have to say. And I think it's just important, as people think about their career, that gone are the days where you're going to stay 40 years with the same company. The only person who's going to really look after your career is yourself. So, you need to know how to think about that. I almost hate to say how to plan your career, but I like to say how to be intentional about your career and how you move and contribute to the industry.

01:04:34 40-plus Years in the Mining Industry – A Career Connected to Great Teams & People

Billings:

You've been involved in many other startups over the past ten years.

Pearson:

Yes, I've had the opportunity of being based here in Denver now for, I think, 17 years, as I've gotten to know people in the industry to work with others on a variety of startup companies. Obviously, Liberty Energy is the largest company that I've been involved with in terms of size, but I've also been involved in a number of technology companies, a cementing company, a wireline company, proppant testing, and fluids testing companies. So there's a lot of opportunities, I think, as you develop technology, as you stay current with technology, as you get to understand the business. There's opportunities because it is a capital-intensive business. Finance people need people who understand the technology. So I just encourage people that as they develop their experience in the industry, there's lots of opportunities to participate with smaller companies, particularly startup companies.

Billings:

Well, you have worked on many projects with many teams over your 40-plus years in the industry. Is there any one project or any one team that was special?

Pearson:

Gosh, when I look back over 40 years, I can genuinely say there's no one team or one project that I'll say was the defining project. But what I would say at every stage of my career, the teams that I was on and the teams that I was part of were absolutely right and critical for my involvement at that time. So, if I go back to my early years with Gulf Oil, just a lot of learning, I was just a young engineer being trained by those around me. The same was true when I went to ARCO to start off with. Then I found an opportunity to bring some of my knowledge and some of my technology, onsite monitoring, and so on to the

company, and start making a difference in the company's operations. Then, using that knowledge to go work with our operations people in Alaska while at the same time learning a lot from them about drill site development, about production surveillance, about reservoir planning, field development, planning, and so on. The opportunity to go teach at School of Mines. To really become more of an interdisciplinary group to understand more facets of engineering, particularly geological engineering, geophysical, and some different aspects of reservoir as well as well construction. Then at Carbo, seeing more of a global international service entity, and what does it take to be a successful service player in this industry. Then, ultimately, doing the private equity here, just being part of teams, kind of pulling all that knowledge together with a lot of great people, and enjoying it. I would have to say a lot of fun. It's not that it's fun all the time. If you were to ask me what was the worst time of my career, I can tell you 2020 and 21. Actually, I'll go back to the end of 2008 and 2009 after the financial collapse. Those downtimes in the industry can be really tough to get through, and that's when you know you're with a good team. When you bond together, and you pull together, and you come through. So no one group, that I would say, but just a lot of great teams. That's what this industry is about. It's about teamwork, and it's about being connected with great teams of people.

01:08:32 A Thank You to Pearson's Contributions That Have Advanced the Mining Industry

Billings:

And now, are you retiring after Liberty Resources, too?

Pearson:

Well, no is the answer. I definitely feel I've got more years to go. Maybe one more E&P company, maybe go back to teaching, maybe just doing start-up board work or something. Maybe contributing more to SPE. I don't know. There's a variety of things that you could do, but when you are a private equity-backed company, there's normally a, there's a beginning, and there's normally a very defined end as the assets get sold or the company gets sold. So, at some point here, when we exit our assets in the Bakkan, I'll be looking for the next opportunity and the next team to work with. And God willing to carry on and to continue to contribute.

Billings:

You've been involved in a lot of key advances and completions for our industry, from on-site monitoring of frac jobs to high-perm fracturing and the whole development of multi-stage horizontal well fracturing. Congratulations on all the projects you've participated in and the achievements of moving our industry to where it is today. I look forward to hearing more the next ten years of our industry advances. And who knows, maybe your next passion of unconventional EOR will one day become a reality too. Do you have any closing comments?

Pearson:

I feel very blessed for working in this industry and with a lot of great people who have been great coworkers, and many became great friends as well. I say thank you to you for taking time out of your day to come and talk with me today, and interview me, and just commend again the role of SPE in our society, and as a technical institution, just has great impact. I just encourage all the young engineers that are starting off early in your career to really take advantage of the opportunities that you have for both

participating in conferences, reading papers, and also getting involved and participating yourself. So, thank you.