BOEM DEEPWATER GULF OF MEXICO HISTORY PROJECT

OFFSHORE ENERGY CENTER HALL OF FAME

Interviewee:	Benton Baugh
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Interviewer:	Tyler Priest
Ethnographic preface:	Benton Baugh was born and raised in Houston, where he decided he wanted to be an engineer. After graduating from the University of Houston, Baugh nearly went to work for NASA in 1965, but that delays in acquiring a security clearance pushed him towards working for Camco and Cameron in the offshore petroleum industry. At Cameron, Baugh installed computer hardware on drilling rigs. After about five years, Baugh went to work for Vetco Offshore (AS Ventura Tool Company), and was the firm's third Houston employee hired. Nine years later, Baugh started his own consulting firm, Baugh Consulting Engineers, where he remained active at the time of interview.

TP: We're here with Mr. Benton Baugh for the 2012 Offshore Energy Center Hall of Fame ceremony. Congratulations and welcome. Thank you for sitting down to talk with me. I'm Tyler Priest. Let's start off with some background information. Where are you from originally and where did you grow up?

BB: I was born in Houston, on the north side of Houston, sixty-nine years ago and have always lived in Houston except for when I was in the army and one semester away at college. I've been married for forty-nine years to my wife Paula. We are still looking forward to our fiftieth anniversary next year.

TP: Congratulations.

BB: Two daughters with two good son-in-laws and five grandchildren who are all wonderful. I actually grew up on the north side, went to high schools all on the north side of town, and then went to University of Houston.

TP: What do you mean by the north side?

BB: When we grew up, it was near the corner of Tidwell and Fulton, which when I was growing up was outside the city limits. Now it's *way* inside the city limits, so Houston has grown considerably in the last seventy years. I've always lived here. As a matter of fact, when I was going to Hamilton Junior High through the middle of the junior high years—

TP: You went to Hamilton.

BB: Yes.

TP: I used to live two blocks away from Hamilton.

BB: My wife lives about probably four blocks away from you. I lived at that time near Sears on North Shepherd.

Basically my goal in life was to be a schoolteacher, because at that time schoolteachers were the only professional people I'd ever seen, and they seemed like people very respected and did a lot of good, which is true. Then when I was at Hamilton in eighth grade, my older brother at the University of Texas decided to be an aeronautical engineer, and I decided I would be one of those too. That was the basis of me deciding to be an engineer. It was the right choice, it's what I do naturally, but it's odd that you have a career choice solely based upon what somebody else did, but it worked out that way.

When I was in high school, my brother was then at Bowen Tool Company, and I got a summer job working there in the old industry, and they dabbled with fishing tools. So that put me in the oil industry, and never considered being anyplace but the oil industry since then.

TP: Then you were at high school at Reagan?

BB: Reagan High School.

TP: You went to Reagan.

BB: Yes.

TP: Then on to the University of Houston.

BB: I had one semester at Abilene Christian in West Texas, and had no money, came home that summer and worked at Bowen again for the summer and was rich, because I think I was making an 85 cents an hour. At the end of the summer, I decided I liked being rich, and so I started going to the University of Houston at night school, and I went all the way through school at night school while working days.

TP: This is still at Bowen?

BB: About halfway through, I actually was sort of insulted by Bowen because I was doing what I thought was some serious design work. I was a junior draftsman, and they posted on the wall that junior draftsmen did minor drawing revisions with oversight. That was my only job, and it hurt my feelings, I suppose.

I went and got a job at NASA. So I went to work for NASA. NASA at that time was off Wayside. We're talking 1965 now, so it was very early. I worked for an hour for NASA, and they called me back to an office at an east end bank and said that I couldn't go to work for NASA because I didn't have security clearance. I said, "Okay. When do I go to work?"

She said, "Well, whenever you get security clearance. It could happen tomorrow. It could happen in two months. It could happen in six months. But you can't go to work till you get security clearance."

So I went and got another job. They never called me back that I got security clearance, and I never got paid for that one hour.

So I went to Camco at that time, and I was about halfway through college. I worked for Camco and then I went to work for Cameron, and the last half of college I actually worked at Cameron, which was Cameron Ironworks at the time.

TP: Camco, what company was that?

BB: That was the name of it. Camco, Inc.

TP: Yes, but is it still in existence?

BB: It was bought by Reed [phonetic]. I think it's a division of Reed at this point. Bowen's now a division of NOV [National Oilwell Varco]. Camco's a division of Reed. Cameron has been a division of other companies, and it's a standalone company again now. So it's come and gone.

TP: It is hard to follow the genealogy of oilfield service companies.

BB: There's a lot of people that know exactly who everybody works for. In fact, I wouldn't even be sure if Camco is a part of Reed anymore, because it's changing so fast now that it's, like, why bother to keep up.

TP: So you went to work for Cameron. What year was that, roughly, about ’66, ’65, ’66?

BB: Yes, ’66.

TP: This is when, I see on your citation, first installation of a computer on a drilling rig. Is that what you were involved in?

BB: Yes. Marvin Jones [phonetic] was actually the primary inventor of the thing. I was a minor inventor of the thing, but literally I built the computer on my desk and went to the field and installed it. We literally used it to kill a blowout. At twenty-four years old, I personally killed a blowout, and I’ll get back to that in just a minute.

The reason I think I built the first computer—and I’m not certain that’s a reasonable claim, but the computer was all air-operated. It used a [unclear] bridge for multiplying and had more automatic relays for adding and subtracting, and so I solved the flow equations with hardware, and then we would put in the data. It would do the calculation and control the choke on the angles to actually control the well in accordance with our input. That’s the computer.

Now, personal computers or anything that you could get out to a well site just did not exist at that time, and so I suspect that no one else had a reason to actually get out with these things which would simulate a computer, and so by accident we did the first computer ever, I think.

One of the most interesting things when I was out installing it on the rig, all the rig hands there, you know, “Get out of my way, kid.” I was twenty-four years, just college age.

Then I got a call in the middle of the night that they had a blowout. There’s a difference between a kick and a blowout. A blowout means you’re blowing out of the well. A kick means that you intend to blow out, but you’ve closed on it, and so it’s not flowing anymore; you just have an unstable pressure situation. So it blew out some, and then it was controlled by the time I got there, but they didn’t know what to do. But I went out there. I was the one that showed up out there on the jobsite, and all the crew is standing around there with a high-pressure well. These are blowout preventers, and they had no idea what to do. So it was, “Yes, sir, Mr. Baugh, what do we do now?”

So I told them, according to formulas that Marvin Jones had laid out, here’s what we need to do to do an annular control of the well so that you can get heavy mud back in and gain control over it again. We did all that and got it back under control.

One of the most interesting things is they had a homemade degasser, which tends to take the gas out of the mud before it grows in the pits, and the pit levels got so low that we literally got gas out and enveloped half the rig in a cloud of gas. Before that happened, our computer still worked, but the automatic choke failed because we had a hydraulic spool valve to control the choke. The BOP

drilling fluid system had so much sand in it that it literally jammed the valve. So halfway through the kill, we had to say the choke doesn't work anymore, but there's a manual choke on there, and a rig hand went to the bottom and was controlling the manual choke. We would call down, "Back it off half a turn, in a half turn" to control it in accordance with the pressure we were calculating on the computer.

When the mud got so low that the gas started escaping on the rigs, literally half the rig caught on fire, and it caught on fire and everybody else evacuated, but the man down on the choke stayed there and closed the choke in and closed it so it shut off the gas supply and saved the rig from burning down. So it singed a few things, but didn't really hurt anything.

But the man who went down there to do that, who I'm sure was a minimum-wage worker at that time, went in with straight hair and came out with curly hair. He stood in enough heat that he literally curled his hair and saved that rig from burning down. And I don't know that anybody ever even told him thanks, but it was an extreme example of somebody being heroic in a situation that was just his job.

TP: Do you remember what platform that was?

BB: It was on land. That happened to be north of Houston in the Cypress area. It was just drilling a land rig and it got out of control on them. Literally had a nice blowout to watch.

TP: So you stayed with Cameron for how long?

BB: Four years and ten months.

TP: Then you moved on to—

BB: Went to what at that time was Ventura Tool Company. It had actually already been reorganized as Vetco Offshore, but we didn't realize it at the time. Went to work for Ventura Tool Company. It was headquartered in Ventura, California, at the time, and I was the third employee ever in Houston, because the manager, salesman, and myself were in Houston at that time. I worked there for nine years, four months, and twenty-one days, approximately.

TP: It's a good thing you have a good memory.

BB: For some things.

TP: When you were with Vetco, is that when you were the lead engineer on the first guidelineless sub-sea BOP?

BB: Yes.

TP: Can you tell us a little bit about that?

BB: The primary design had been done by Shell employees, and no one had ever done a guidelineless system before, and the Shell model had what's called a latch bumper head, where you brought the BOP stack down in the range of the subsea wellhead, and then on the wellhead you had a ten-foot bounder funnel [phonetic] looking up, which you would lower the latch bumper head out and it would go in. It would stab into the subsea wellhead. Then you would slide the BOP stack down, and it would press a funnel down and land the BOP stack. That was the method of landing at the time.

We did that one, completely designed the thing, built it, and it was the first one ever to go in service. Oddly enough, Cameron was designing a competitive system which did not have a latch bumper head, but depended upon a very much better BOP stability just to go down and sit it on the wellhead. So we knew at the time that either we had too much funnel or they didn't have enough funnel on.

TP: Now, what's the advantage of a guidelineless BOP?

BB: To go down six to ten thousand feet, just the guidelines to go down and get there would become very heavy, very expensive to install, and if you can go down without guidelines and simply land on the subsea wellhead, you eliminate a lot of complexity on the drilling rig. If you were in three, four, five hundred feet, it's not a big deal, and so you would have guidelines. But it substantially reduces the cost of the rig to not have to have guidelines down all the way to the bottom during your drilling operations. So it's something very practical to do, and it was a very logical step forward.

TP: It became pretty much standard after this?

BB: Yes, it is. After that, all deepwater rigs have guidelineless now.

TP: That was the *SEDCO 445*?

BB: Right. That was the first rig to ever be guidelineless.

TP: Did Cameron then compete with their different systems, or how did that play out in the market after that?

BB: In the market they both competed, both of them, and it was ultimately demonstrated that the funnel that Cameron had, which was very smaller, they had enough control to work with that one. So, ultimately, Vetco Systems slipped over and did the same kind of thing Cameron was doing.

TP: What strikes me, looking at your materials, is the variety of different things that you worked on. A lot of people specialize in one area, whether it's BOPs or ROBs, and it seems like you've done it all.

BB: What I typically like to say is a lot of people have one year's experience fifty times; I have fifty years' experience one year at a time, so it's very different. But I've shifted around. It's interesting. It's very much a variety, but it always happens to be with machine design of oilfield equipment, and so there's a commonality to it, but it's very varied within that commonality.

TP: I guess we can move on. It looks like a lot of different achievements in chronological order here. You also had the first low-wattage failsafe subsea control valve.

BB: Yes. Whenever I saw that happening, and this was back in the Vetco time, they made subsea valves to operate and control the BOP stacks, and the tests they used at that time was to turn it on overnight. They came back in the morning, it hadn't burned out and you could put your hand on it and didn't burn yourself, then that was good. That was the test program. But they burned like 80 watts continuously. It was a valve which was about 4 inches in diameter, 12 inches long, so 80 watts continuously into it, it's like an 80-watt light bulb, literally, all the time.

I started trying to develop a valve and was actually doing it on the workbench at home, and I observed that when you get magnets very close together, that the force goes up tremendously. It goes up more than exponentially. But two magnets an inch apart don't do anything. Quarter-inch apart have a load. Eighth-inch apart have a lot. At a thirty-second, they got a lot of pull.

So what I recognized to do is that when you punched a button, if you'll put 80 watts into it, it'll operate your valve. When you come back, if you don't go to zero but if you go to 1 watt of current, at that close distance it will still hold it in place. It latches it in place at that point. So basically whereas everyone was having to burn 80 watts on every valve just to make it operate, you drop it down to where you could have an extremely low wattage to do it, greatly reduce the electrical requirement of the subsea BOP stack.

TP: What kind of cost savings are you looking at?

BB: Ultimately you have to have the same wattage capability to operate the valve. You're just saving electricity after it's actually latched in place, and so you probably save $20 electricity a month. The equipment is functionally the same size. It just reduces the requirement you have to have for backup batteries. If you want to do anything with backup batteries, it makes it very different.

TP: You need every inch of space on a platform you can get, so anything you can conserve is useful.

BB: Yes.

TP: Then you also got involved with ROVs.

BB: Yes. ROVs have been an interesting thing. Mostly at Vetco I designed subsea completion systems and did a lot of work on that and always tried to put an ROV profile on the backside of them, which would allow you to operate valves, which is what ROV backup [unclear] and always had a lot of resistance from the ROV industry. The general idea was that there was more money to be made in designing new profiles than there was in selling a few standardized profiles. So I was never able to get any information on an ROV profile to put on the back of a valve, because no one would tell you anything. I mean, I literally had an offer, back when I was a consultant, for $35,000, somebody would design me a profile.

TP: What do you mean by a profile?

BB: When ROV goes up to do something, most of what the industry has done is they've had manipulator arms, which are really fancy. One thing I like to say is they have force feedback fancy arms that will literally pick up an egg off the ocean floor without crushing it. The problem is, there's no eggs on the ocean floor. We need some oilfield interfaces that will do multiple tasks where you can engage the side of a BOP stack and do a lot of tasks, rather than just have a one specialized arm. I've always been an advocate of multifunction-capable profiles. I was never able to get one from anybody else.

When I was on API1 7D Committee, I literally designed a range of them and donated them to the public domain, donated API, and the ROV companies did not like it, but ultimately I would not stop. So it was put in the appendix of the API 17D as one of the options they would consider using, and they put a couple other options. They didn't intend for anybody to use either, but one of the other ones became the simple standard.

At this point, especially after BP Macondo, we were having an intensity program where we would have a single profile designed and we're trying to advocate the industry to use. It's about 16 inches in diameter, and if you'll put eight of these around a BOP stack, it will provide an ROV to come down with 100 percent control of the BOP stack in a Macondo-type situation. It will let you go in and share your grams, do a top kill quickly, do a junk shot quickly, all the things that you saw at Macondo where they went in and—in fact, if you saw, they went in and tried to saw hoses in half and put fittings on the end of hoses with an ROV, which were functionally heroic maneuvers which they did and tried to do some stuff. The problem with that heroic move that they were doing there was

that they shouldn't have had to been doing it. They need control of the BOP stack.

TP: Talk about standardizing ROV access to the BOP stack. I can't believe that it isn't standardized.

BB: Believe it. I mean, literally, I am pushing this to the point that it is my goal to make this happen to where if, say, you're Macondo, your rig is on fire, any other BOP in the area has an ROV that will come in and engage your BOP stack and gain control of it. That is technically very practical to do. Politically, decision-wise, it's very hard to do.

TP: People like to have customized—what's the opposition, the hurdle?

BB: I'm going to give you my standard answer. It has to do with wind forms. Wind forms have wind generators which have three skinny blades on them. You've seen these, right?

TP: Yes.

BB: Okay. They lose money. They're typically there because the government grant gives them money to put them up. Then after they're there, they lose money. After a while, a lot of them just go into disuse. If you had four times as much power from it, they would likely be economic. You don't think they're so bad that you've got to go by a factor of four just to get economic. But if you get to be economic by gaining four times as much power, that would be a good deal.

I normally ask people, "Tell me what it would take if you have three skinny blades to become four times as powerful," and give them a minute to think about it. I'm not going to do that to you. I'm going to do you a favor. The answer is put twelve blades on it. Okay? And basically if you put twelve blades on it, you've got four times as much surface area. You'll gain four times as much power. You're much more likely to be economic in what you're doing. Okay?

Twenty years ago, I went to the chairman of the [unclear] Wind Energy Division and said, "Why don't you put twelve blades on? You'll be four times as powerful." I got a blank stare.

For the last twenty years, I have been telling people, preaching, doing various things to try to convince people. I even have on a personal website a sarcastic paper on this that shows why if you had put twelve blades on it instead of three, you'd gain four times as much power. You'd likely be economic.

They still make three-blade windmills. I've seen more excuses, more strange answers. Had a college professor tell me, "All the formulas are for two or three blades, so what are we to do?" I said, "Multiply by four." [laughs] He didn't relate to that. But there's no patent to be gotten in it. It's not a practical thing for me to manufacture. I've been preaching this for twenty years.

This is not just an oilfield problem; this is a common problem with all people, that it's hard for people to change. We've got people who have been making a kind of a profile. I've got my profile. This is what we do. The collective decision and willpower to say if we're really going to get safety in offshore operations, we need a profile so common and a program to your BOP stack so issued that an ROV from another drilling rig can come over there and say they've got a CDRA. They punch in your profile. They hit profile number seven, pressure port number three, it closes your shear rams. It's very easy-to-do tasks.

TP: None of this made it into the new rules and regs for BOPs?

BB: No.

TP: Was it even considered? I see you testified before Congress.

BB: I testified before Congress on it.

TP: On this issue?

BB: No. There was strictly a question on what was the safety of BP's operation, and I had been a reviewer on some papers that they've had. I have suggested this to these people, and they have not put it in the regs. But it's a matter that I would suggest to you that this is extremely easy technically to do. It's a willpower thing. Whenever all the appropriate officials listen to all the appropriate high-ranking company people and they tell them it's just not possible, they are functionally constrained to believe them. It's an interesting process. Just as an example, I have licensed a deepwater accumulator that is a fantastic licensing success. I invented it, prototyped it.

TP: Deepwater accumulator? Explain to me what that is.

BB: When you go down to operate your BOP stacks subsea, you need power to operate them. So you typically have an accumulator which has a bag in it and has a nitrogen charge on it. The liquid that you pump into it will have the pressure of the nitrogen, so you have a storage of hydraulic fluid with a pressure charge on it. Whenever you need your BOP stack to operate quickly, you don't come down a small hose; typically you draw from your accumulator and you close your rams quickly.

In conventional wisdom, an accumulator to surface you charge to 3,000 psi and you have a 3,000 psi supply of fluid to do something with. You go down 6,000 feet, everything's at 3,000 psi, and so the accumulator is functionally dead. If you open the valve, nothing happens because there's 3,000 psi inside and 3,000 psi outside. So if you want to operate it, let's say, at 6,000 feet, at the surface you've got to charge to 6,000 psi, which is higher, more dangerous pressure, so

when you get to 6,000 feet it'll still operate. When you're operating 10,000 or 12,000 feet, it's even worse.

So basically you have the situation, and what I did was a depth-compensating accumulator which uses a double-piston. It looks sort of like a dumbbell. One side of it actually takes seawater pressure and presses on it, so if the accumulator at the surface which has atmospheric pressure on that side shows 3,000 psi, when it goes to 6,000 feet I'll be shoving down an extra 3,000 psi worth from the environment, so the output fluid will come out at a real pressure of 6,000 psi, which is still 3,000 psi higher than the ambient conditions. So no matter what depth you're at, it compensates for it.

TP: This is a relatively new invention of yours?

BB: No, I invented it seven years ago, patent issued seven years ago, and I spent seven years trying to sell it. Two years ago, I licensed it with a very nice license deal, but basically after seven years of working hard and hustling this thing, it was suddenly an instant success.

TP: After Macondo.

BB: No, this was before Macondo. But it's sort of what you have to do when you're going to invent, try to develop things. You've got to recognize that you've got to expose it to people, give it time to sink it, give it time to let them have mental gestation, whatever you want to call it, because it's seldom that you actually have a really good idea, and people, "Oh, yeah, let's go right now."

TP: That's a recurring theme in this industry, that it takes a while.

BB: But not just this industry. That's said, and I typically object to that. It is every place. That's why I use the wind turbine thing. It is so obvious that if you put twelve blades on a turbine that you'd get much more power within the same space very economically.

TP: There'd be no weight issues?

BB: On the tower, it's going to cost you about 5 percent extra to make the tower. The foundation is going to cost you maybe 10 percent extra, but you'll have a very minimal increase in cost to get four times as much. It takes the same crane to come out there and set it up. It takes the same people to put the wires out to it. You would probably increase the cost of it by 25 percent, get four times the power, and that's good business. So what I'm saying, this is a human condition, it's not an oilfield condition.

TP: So I guess you would identify yourself as an oilfield inventor. You look for opportunities in whatever area to develop new technologies.

BB: To a large extent, I don't look for things; I just think things. I actually have an array of inventions. Primarily the bulk of it's in the oilfield, but I have inventions in automatic transmissions, stopping floods in Houston, cleaning up the beaches at Galveston, mass transit, and how to slow a hurricane down. Incidentally, I have an invention in how to slow a hurricane down. The patent examiner refused to issue a patent, so I don't have a patent on it.

TP: I'd like to hear about that one. Is it complicated?

BB: No. First thing you do is you go to New Jersey and get six battleships. The idea is that functionally a hurricane draws strength from the water, from the temperature of the water. As it goes across warm water, it gains more strength and just gains power, becomes a larger hurricane. Take your battleships and basically turn what it would be like the cannons straight up, put 10,000 psi horsepower pumps on it, and then go out and meet a hurricane in the middle of the Gulf of Mexico, and draw water from about 400 feet down where it will be cooler, blow it straight up in the air. Stay in the hurricane all the way to shore, and what you have done, you put a large column of water in there which will mechanically obstruct the wind and take energy from it. You will have put cooling water in the air, which will take energy from it. Then the hurricane will blow the water, spread it out over the surface of the water and cool the surface of the water, which will take energy from it. So if you drain energy from it all the way to shore, you're not going to stop it, but you will take a lot of energy out of the hurricane. Let's say you slow it down from a Cat 5 to a Cat 4, it will be a very good thing to do. The patent examiner didn't think that was [unclear].

TP: He didn't?

BB: No. He never sympathized.

TP: You should go into the IT field, because they'll patent anything in IT, apparently, or in computer technology. Did you hear about the controversy over the size of the iPhone?, that Apple won this judgment against Samsung because they copied the size and shape. You can patent actually the size of the phone.

BB: Actually, I have been there. I invented the Microsoft natural keyboard, the one that's like this, I invented it, and whenever I sent the patent in, they sent back Microsoft's application. It looked like you could lay the grid on top of mine, but they were there first, so they submitted it before I did, so it doesn't count.

I invented a system for absolutely making sure a virus couldn't attack your computer, and somebody else did exactly the same thing before I did. So I've been—

TP: You've been late a couple times.

BB: Yes. Lowest success rate in IT.

TP: The first gimbling J-lay tower, you want to tell us a little bit about that?

BB: Yeah. We were asked to go to Brazil to be an expert on J-lay tower design, and I'd seen—as a matter of fact, Carl Langer's here, and he had done a presentation at [unclear] one time.

TP: First tell us a little bit what a J-lay tower is.

BB: Basically, normal pipeline in shallow water is called S-lay. You have pipe that's welded horizontally on the deck of a barge, then it bends down and it bends on the ocean floor. It makes an S. J-lay, the tower stands up and it only makes a single bend at the bottom like a J, and so it [unclear] at the operation on the rigger near vertical rather than horizontal. So you avoid that other bend. It was especially useful to start with because the size of the barge and the stinger that allows you to do this in S-lay gets so massive that it was much more convenient to lay in a J-lay mode. Now, a lot of the stingers today just got messy, so they can do a lot of this stuff because they just built giant barges. But we built the first tower that would gimble. There'd been a couple made that were J-lay before that. In fact, I was saying Carl Langer made a presentation. So when Oilstates [phonetic] asked me to go to Petrobras with them and be their expert, I said, "Well, I listened to Carl's presentation one time, so I guess I can be an expert."

So they said, "Design your J-lay, so we can go down and have something to talk about." I was not a pipeliner at all, and whereas if you knew what you were doing, you would take conventional equipment and stand it up, which makes a giant tower. I was familiar with drilling rigs, and so I took a drilling rig and leaned it over, which made it a—it was so much smaller that one of our main sales problems was although it would do what the large ones would do, it wasn't big enough to be a real J-lay tower and didn't cost enough to be a real J-lay tower. That was the most common complaint we had: it didn't cost enough. I figured out how to fix that.

But basically you're bringing pipe sections up and you're welding them and lower them one at time to go into the water, but literally went from scratch and leaned a rig over, designed one, and ultimately Oilstates was successful in getting the contract, and we completely designed and built the first J-lay tower. We built a second one, in—

TP: It was in Brazil for Petrobras?

BB: The first one for Brazil and Petrobras.

TP: Where was that, in the [unclear] basin?

BB: Yeah. We built a second one which was with Shell and Stolt [phonetic], which went to West Africa to lay pipelines over there.

TP: That was about around what time? What year was that?

BB: The late nineties when we did the first one.

TP: J-lay pipelines had been around for how long prior to that?

BB: Probably thirty years before that. There had been someone who tried to lay pipeline from a vertical derrick, which is hard to do a lot of stuff. So there would be some history probably back to the fifties of people attempting to do that.

TP: But not really until the nineties?

BB: Yes.

TP: You founded your own company. Is that the company you remain with today?

BB: Right. I'm still the president of Radoil, Inc. I actually started Baugh Consulting Engineers in 1980 and Radoil in 1981.

TP: You'd moved from—I'm trying to figure out where your progression is.

BB: I started [unclear] Division of Brown Oil Tools before that, so worked with them for two and a half years and built [unclear] units. That market got pretty much saturated, and so I left Brown and started consulting. Actually, I was asked to be a consultant for one of the people that we'd made what's called a hydraulic work unit, which is like small rigger, run tubing on completion, all hydraulic, lifted pipe with cylinders, and we built a fairly fancy one for them and Brown decided to get out of the business. So, basically, I became a consultant. The basis was to maintain that for them and do other design work with them.

TP: And you remain the president. You're still active, in fact.

BB: Yes.

TP: I find it interesting that you've attended every single Offshore Technology conference.

BB: Also find it interesting that I'm offended that they haven't given me an attendance award either. No, actually, the first one was interesting. It was in [unclear] downtown.

TP: Sixty-nine, right?

BB: Yes. And I worked for a boss who you would call really tight. He registered himself only to go to the conference, and we had like six guys who were employees here in Houston at that point.

TP: You were with who at that point?

BB: Vetco Offshore. He went down there, and he recognized that when you go through the registration at the front, right in the middle of it, the parking garage just came up into it. So he went back out and he got us all. He parked in the parking garage, and we rode up the escalator, appeared in the middle of it, right next to the Cameron booth, and so we were in the OTC for free. So I would not be a registered attendant at the first one, but I was there.

The next year they figured out how to stop that nonsense, and so we actually had a booth the next year showing the Christmas tree the next year. But I've been to every one. I got a kidney stone one time on day two, so I haven't been to all of them, but I literally have worked most of them and attended all of them, attend every OTC, including the one last year in Rio.

TP: You went down to Rio?

BB: Yes.

TP: That was the first sort of OTC outside of Houston.

BB: Yes, first ever anyplace else. And also the crawfish boil. This next year will be the twenty-fifth anniversary of the OTC crawfish boil on the University of Houston campus, and I originated that, literally, and I've attended all of those, still work that one.

TP: Good for you. I'm kind of just jumping around here because there's so many interesting topics to talk about. Going back to Macondo, you testified before Congress. There's a lot of attention and press about the failure of the BOP, and as someone who's worked with BOPs, I don't know if you're representing or you're employed with any of the litigants in this, but can you talk about what are the

design flaws in deepwater BOPs, where the industry might be going with it? You mentioned already the ROP profiles that don't seem to be happening.

BB: Basically all the lawsuits primarily would be one of my customers against another one of my customers, and for professional reasons, I have elected to be an expert witness for nobody, but tell anybody they call I will tell them what I think about anything they want to, to help get this thing over with. But I will take no money from anybody and have talked to a number of people about it on both sides of the fence about what the situation was.

The BOP stacks today are a very fine piece of equipment. They are very good. One of the problems that you need to recognize is if you did everything perfectly today, tomorrow you would do something better. So if you say we want to do all the things that are going to exist in five years, let's do them all right now, it's just not practical to do. There's things that take time to assimilate, and so it's a process.

There's things that I'm very much in favor of the industry adopting, and the concept that any ROV in the Gulf of Mexico should be able to go down and engage any BOP stack and shut it down, there's no patent in that for anybody, no way to make any money. That is a very logical thing to do, and I think we need to get the industry resolved to do that.

There's other things that we actually have a patent on. One's a shearable drill collar, which I would like to see implemented. What that means is, as a background, in 1979 Ixtoc off the coast of Mexico was the second largest offshore blowout ever. It happened because the drill collars were in front of the shear rams, and they could not cut them, could not close on them, and so it allowed the blowout to happen. It's a scenario which can happen to any rigs, typically for a reasonably short time period, and so it's one of those things that you hadn't had a problem with that, till it becomes a problem, you sort of don't focus on it.

But whereas everyone before had focused on what you do to shear a drill collar, as a little bit of background, a drill collar is the weight right above the bit. Your idea is you're going to focus weight on the bit. It is very high-strength material because you need a quality metal on the end for the rotary shear connections on the end. It is a very thick wall because you're looking for weight, and so it is basically close to unshearable. By unintended consequences, it's the strongest thing known to man, almost.

Whereas everyone typically focuses on how can we get better shear blades, more force to shear these things, I looked at it from the opposite side, says, "Why don't we make them more shearable." So what I did is I made a drill collar, which the wall thickness of it is the same wall thickness, thin wall, as the drill pipe above it is, which means it is strong enough. That makes it basically an outer skin. The inner skin is a small piece of steel pipe, which is easy to shear. Between the two, we just filled it up with lead. Now, lead shears like butter, so this thing shears like the drill pipe above it does, and not only that, but—

TP: It has the weight.

BB: Yeah. It is actually even heavier than a regular drill collar, because this is functionally made out of lead. So it is not as strong as a regular one; it is as strong as it needs to be. The one right now is just stronger than it needs to be, basically. And I think that is a very appropriate safety step to take in the Gulf of Mexico.

TP: That happened at Ixtoc, not Macondo.

BB: Not Macondo's problem. Macondo, I think they'd had some maintenance problems with some of these things. There was some equipment that was down. But I think they ultimately judged that there were nine things in a row that had to have gone wrong for that to happen. There's a lot of safety systems, but it was like nine things in a row. If any one of those things hadn't happened, this wouldn't have blown out. It took a confluence of a lot of different mistakes to make that happen, and it was interesting.

TP: I read some studies, I think by West Engineering, that the deepwater BOPs failed and the rams failed in a bunch of tests. Is there a problem generally with that at those depths?

BB: It's not a depth problem at all. Other than accumulators, if you take care of the accumulators, it doesn't matter if you're in 100 feet of water or 10,000 feet. There's an impact other than safety. The heavy column of mud has to be handled differently in different things, but the actual drilling, the actual accumulators are different, but the BOP stack itself, the conditions don't change that much.

Now, one of the situations that happens is you go out and you qualify a block of pipe stack, and you shear all the pipe that exists, so you have a product on the market that sheared all the pipes that exist. Somebody comes up with a higher rate of drill pipe, slightly thicker wall of a drill pipe, and so you end up in a thing where you push the envelope a little bit, because you're out there, you're drilling. Somebody brings in a new string of drill pipe who actually says, "Wait, this drill pipe is actually stronger than what the tests were back there. We need to actually test on this drill pipe." But you don't do it in giant steps. It just gets a little bit stronger today and a little bit stronger the next day, and gets a little bit deeper today and a little bit deeper. So you creep into things which you're sort of going into new frontier and don't necessarily always vet all the potential problems that might be there. Macondo had brought to light a number of things that we just kept going a little bit, and we really haven't considered all the things adequately.

TP: We're kind of running to the end of our time, but I wish I could talk to you at length more about this. Maybe someday we'll be able to do that. I appreciate your volunteering your time, and congratulations again and hope to see you at the gala tonight.

BB: I'll see you there.

TP: All right. Thank you.

[End of interview]