MMS OFFSHORE GULF OF MEXICO

ORAL HISTORY PROJECT

Interviewee: Herb Holdridge

Date: August 4, 2006

Place: Houston, TX

Interviewer: Jason Theriot

Keyword: Port of Houston/Houston Ship Channel, Texas City Refineries

Bio
Herb Holdridge grew up in Galveston, Texas, where his father worked at Todd's Shipyard. Herb joined the Navy V-12 program at University of Texas during World War II and majored in chemical engineering. He started at Amoco in Texas City in 1949 and worked in R&D for 10 years before moving into personnel. He retired from the refinery business in the 1980s.

Tape 1, Side 1

JT: This is an oral history interview with Herb Holdridge on August 4th, 2006, by Jason Theriot. Herb Holdridge worked at the Amoco refinery 1948 to ’58 on the ship channel. This is Herb Holdridge on the Port of Houston, tape one.

HH: I’m Herb Holdridge. Jason, I got out of high school in 1944 and went right in the navy. I was seventeen, and the navy sent me to officers’ training in World War II, a program called V-12 in the navy, at University of Texas. I alternated, they transferred us between Texas and Georgetown University, and back to Texas, and in ’46 I was discharged. You know that was well after the war, and discharged on

points down at Hitchcock, Texas, Fort Wallace I think it was called. That's not there anymore.

JT: Were you born in Houston?

HH: No, I was born in Vicksburg, Mississippi. My dad was a machinist, learned his trade with the railroad in Vicksburg at a roundhouse, for a subsidiary of what's now Illinois Central. It was something Missouri, Yazoo, and Valley of something Railroad. But anyway, then Dad moved to Louisiana, went to work in New Orleans for a short time, I think with a ship repair yard.

But then he went with Pan Am refinery for a short time, then went to Shell's refinery at Norco, and I guess when they built Deer Park, when Shell built a Deer Park refinery they transferred my dad from Louisiana to Texas, to Houston. I was in about the fourth grade when that happened, sixth grade, somewhere in there.

Then during World War II my father went to work for Todd's Shipyard in Galveston, and we moved to Galveston, and I graduated from a high school in Galveston called Kerwin. It was a Catholic high school. It's now known as O'Connell High School, named after a famous bishop from Galveston.

Got out of high school, I told you about going to college. I majored in chemical engineering at Texas, and went back after getting discharged in '46 and finished up in chemical engineering, in ROTC I guess. Then I went to work for Amoco at Texas City in the research and development department. Amoco was an independent of Standard [Oil] of Indiana, and BP, which owns everything now.

It was a large refinery. I think when I went to work for them we ran maybe at least 100,000 barrels a day, and that took a lot of crude coming in, you know. A

lot came in by tanker, and a lot came in by pipeline from the United States' domestic production. There was no offshore at that time.

JT: This was '48 when you started working?

HH: Yes.

JT: Where was that Amoco plant exactly?

HH: That was in Texas City. There were two big plants there, Monsanto petrochemical plant, Monsanto and Union Carbide. I think they're both still there, as is Amoco, and there are other little small refineries. I think there was a small Marathon refinery there.

I worked in research and development in economic evaluation of proposed innovations, and in process design, the design of equipment, and finally I went to work in personnel-type work, and actually recruited chemists and chem engineers to work in the R&D department. The R&D department served as kind of a primary school for refinery administration people. You know, you could move from there to refinery operations. I never did that.

I went from recruiting for the R&D department in Texas City, of Amoco, to hiring technically trained people to sell petrochemicals for the chemical division, which was just formed, and formed about 1957, and was transferred to Chicago. They were headquartered in Chicago. I think we moved to Chicago when, Mom, in—well, I went to the University of Michigan in '51, got a master's, '51 to '52. So I think in '58 I moved to Chicago.

I was in the marketing department. We had technically trained people selling petrochemicals. From there I went into sales and bounced around. I worked in

the Chicago area and the St. Louis area, and wound up in Houston with a division called the oilfield chemical side of the business. We sold corrosion inhibitors to the oil companies, the producing sections of the different oil companies, and things like that, emulsifiers, chemicals used in refineries to prevent corrosion, and desalting-type chemicals.

Crudes produce a lot of saltwater and you have to separate that out, or neutralize it some kind of way, and the refineries have de-salters that do that. All the crude coming in goes through those things. It's a process developed by a company called Petrolite in Houston, that developed those processes, and oil refineries used to have them. I guess they still do.

That's probably becoming more and more in the front as oil gets harder to produce; you produce more brine with it. Saltwater, they call—that's brine, comes out with the crude, often in an emulsion form. So you have to separate that out, and there are chemicals you can add to help that process, called emulsifiers. Like you can add those to mayonnaise and it'll just separate out into oil and water.

JT: Really.

HH: Yes. Anyway, I retired from that kind of a job, and sales and product development I was in charge of until '83, when I retired from the company. So I've been retired quite a while.

JT: And what do you do with your spare time?

HH: I did a little genealogy for a long time, on Dad's side of my family. I don't know where it all goes, to be honest with you. I really don't know. I like crossword puzzles. [laughs]

JT: Let's talk about your dad for a second. Now, why did you get interested in chemical engineering? Was it because of growing up with a father who worked in the business?

HH: No, my dad really wasn't in that. He was a machinist, you know, and I think that if he got past the sixth grade in grammar school, that was as far as he got, I'm sure. He was born in 1898 in New Orleans.

JT: So he got involved in the oil industry at a very early age.

HH: Yes, but repairing equipment, you know, maintenance.

JT: Did he talk about it much when he came home?

HH: No. But his ability to repair anything impressed me when I was young. We didn't talk about it much. I talked about his work, though, as I got older, and when he moved to Todd Shipyards in Galveston during World War II, he must have moved there, because we lived in Galveston when World War II broke out. December seventh we were in Galveston.

Dad repaired, worked on a lot of ships that had been torpedoed. Todd's was a major shipyard in Texas, *the* major shipyard. And shipyards have shut down, a lot of them. Todd's was one of the remaining ones for years, and they're still down there in Galveston, as you probably know.

He would have to go sometimes on little ferry boats to ships that were tied up in the roads, they called it, off Galveston Harbor, in Galveston Harbor I guess, waiting to come in to be repaired, waiting to get to the dry dock, or there might be ships out there waiting to get up the channel for some reason, because of traffic, where they had a problem. He would be ferried out there, and he would always

come home sick, because he was seasick-prone. [laughs] Yes, we talked about that a lot.

JT: Was there fear in the community in Galveston, being so close to the submarine threats? Did you folks understand what was really going on?

HH: Yes. We had to pull the shades down at night. They didn't want any lights shining out of windows, and stuff like that. I remember that. Galveston was fortified pretty good, at either end. At the east end of the island, and near the west end, near what they called the west end now starts, like around past 61st Street there was a big fort, and gun emplacements are still in existence there at that big hotel on the Galveston beachfront. I forget the name of that one.

JT: The San Luis?

HH: Yes, yes, yes. Big gun emplacement's still there.

JT: Now, did you have drills in school of what to do in case of an emergency?

HH: I don't recall that, and I was in high school, yes. We may have had them, but it didn't impress me to where I remember it, no.

JT: Was it broadcast on the radio, or kind of in the newspaper that there was danger just off the coast?

HH: Everybody wanted to join the army or navy or air force. No, we were teenagers, we didn't worry about that very much; I don't remember it.

JT: So when you joined the navy did you get stationed on a ship?

HH: No. I went right to, got on a train in Houston and went right to University of Texas at Austin. I never have been on a ship, a navy ship, except maybe the *Texas*. No. That was interesting. At Georgetown there were 300 sailors, of which I was one, and there were 300 girls at Georgetown University. Southwestern University was the name of it, it's a Methodist school, and it had a V-12 unit. There were 300 sailors and 300 girls, and about five guys that were not in the navy, so we kind of liked it.

Then Texas, of course, University of Texas when I was there was like ten to thirteen thousand students. It's now over 35,000 in Austin. Go ahead, ask me.

JT: Well, let me ask you this first question about, since you lived in Galveston, had a career in Texas City, and have been around in Houston. In your experience, in your experience with old stories, have you ever heard of some of the fierce competition that occurred between the Port of Galveston and the Port of Houston, and do you have any input on that competition in the early thirties and forties?

HH: Not really. Not really. I recall that the rise in Houston Port tonnage was primarily due to the 1900 storm in Galveston, which really wiped out the whole city, I guess, and people realized that that was kind of a golden opportunity for Houston, you know. It's kind of like New Orleans is facing right now, I imagine, people really evaluating if they really want to redevelop that area heavily.

JT: Do you think that it was Galveston's misfortune of being right there on the coast, and possibly fear of another major hurricane, or was it the simple fact that these people hadn't recovered after thirty years?

HH: Well, I think it may have had something to do with rail, too. Galveston is an island, and Houston is so much more easily accessible by rail than Galveston was, because as I recall, when we moved to Galveston there was one bridge connecting

the mainland and Galveston. It was a railroad bridge as well as a highway bridge. The railroad was in the middle, and one lane went into Galveston and one lane came out, and that was it.

JT: Pretty isolated.

HH: Yes. So I think that was a great limitation, and a lot of cotton came into Galveston and shipped out of Galveston, and I think it all was handled coming in by rail, and going out by ship probably. Cotton Concentration Company was the name of a big operator down there.

I don't know to what extent Galveston ties in with the ship channel and the Port of Houston. It's kind of independent, isn't it? It's not on the ship channel. It's in the bay, right. But I sure agree with you that I think the big investors, you know, willing to gamble, saw the opportunity to make Houston, to really give Houston its economic start, and certainly when they dredged that channel that was a big deal. I guess they've done that two or three times, deepened it.

And even now you mentioned lightering. I guess that's kind of becoming more prevalent all the time, bringing huge tankers in that they can't bring up the channel, I presume. But they anchor out and then they unload the smaller vessels that do come in. But some of those vessels are pretty big, I think. [laughs]

JT: Those lightering ships are huge.

HH: Yes.

JT: The photographs comparing, you know, right alongside some of the big ships that are coming from Africa and the Middle East. I mean, I'm sure that there's a tremendous depth in difference, but as far as the outside—

HH: The size, they're both—

JT: Real close. Now, World War II was a watershed event in a number of different areas. Primarily for this study and for your experience, it had a tremendous impact on bringing the petrochemical industry to Houston.

HH: Yes, right.

JT: Why do you think that World War II had such an impact on that industry in bringing it here?

HH: Well, the fact that the refineries were here, gasoline was needed, the fuel was needed. World War II for aircraft, aircraft demanded a special fuel, aircraft gas, avgas we called it. It required certain properties that the regular gasoline didn't have, and that required different processes and equipment to make it, in the development of it.

I mentioned to you sulfuric acid was one of the things that's needed. It's used as a catalyst in a process called alkylation in refineries, that makes a very high-octane gasoline. It uses sulfuric acid as a catalyst, and they would bring tank cars in of that stuff, and the tank cars would empty the fresh acid, and they would take the used acid back and reclaim it, and that contributed to the construction of sulfuric acid plants in the Houston area.

So World War II, avgas was really in demand, hadn't been to the extent that it was in World War II. Chemicals for explosives, TNT, tri-nitro-toluene. We made toluene down there. That was developed during World War II, how to make toluene out of petroleum. Before, it came out of coal, coal oil or something.

But we knew it was in the gasoline, we just had to find a way to extract it, and so they developed processes for that, for toluene extraction.

At Texas City we used a process called phenol extraction. I don't know if you've ever heard of that chemical phenol, but that again was a need for a chemical plant in the area to produce that stuff, we used so much of it. I was down and worked on the production of the first petroleum benzene that was produced. Benzene is one of the major components of polystyrene, which, you know, your insulated containers for coffee are made out of polystyrene, and your beer, ice coolers are made out of polystyrene, and that's big, that's big.

Benzene they used, and a lot of other chemicals. But benzene is in the chemical family that toluene is in, so along with toluene we started producing benzene by the same process that we used to produce toluene, and that was a big boon. That's a big industry. That goes out of Texas City by barges, benzene, up the channel to the chemical plants, which make polymers.

JT: Explain that whole process to me, in general. Let's take a crude product, for example, crude coming out of the gulf or being imported from another country. Walk me through the process of how that barrel of crude makes it into—

HH: Say toluene?

JT: How does that work?

HH: Okay. Crude comes in and it's desalted, that's the first step. Storage of it, getting it there is important, you know.

JT: So it either comes through a pipeline or it's lightered up through the channel, and then where is it discharged? Is that at a dock?

HH: At the docks. All the refineries have docks, all the chemical plants have docks that produce in quantities sufficient to justify marine transportation. A lot of stuff moves out by railcar, too, you know.

JT: So is there one discharge area that goes out to several different plants, because I would imagine that let's say Amoco wouldn't need an entire cargo from a lighter. It would probably only need *x* number of barrels, wouldn't you say? In other words, how do they separate the substance?

HH: Well, each plant has its own dock, okay, to my knowledge, and, of course, crude can move through pipelines too, from the dock area, I would presume, although I'm not positive of that. So it could be shared by pipeline, but I don't think that's very prevalent. Crude comes in, is desalted, and then it goes to a crude unit, which it's like crude is a mixture of hydrocarbons, you know, with different boiling points.

Methane is the stuff in natural gas that powers your house, you know, you use for heating. That's the lightest thing, that's the lightest hydrocarbon in crude, very little in crude. They normally try to get that out before it even leaves the field. In the oil production they have degassing plants where the volatile stuff they separate out, you know. They have separators.

JT: They do this offshore?

HH: No, they'll do that onshore. Yes, they'll do it on the big platforms, yes. You'll separate out the gas from the oil, and the gas they'll put in a pipeline and go somewhere, and the crude will go somewhere.

Now, the crude comes in then. Okay, it's desalted, and you have saltwater disposition, right. So the EPA gets involved there heavily, right. That's saltwater. The refineries are located along transportation routes, but also along disposal routes, so they have to treat stuff that they put out. Very little hydrocarbons are allowed in the effluent that they discharge. Now, they discharge some of that effluent into wells, believe it or not, that go deep and below the water, potable water wells and stuff like that.

Well anyway, the crude is separated in a crude unit. They knock out the light stuff, lighter methane and down to like ethane, propane. Propane containers that you use to power your grills, that comes overhead, then they have to separate those. Methane will be separated, it boils off first, you know. So the process is the stuff is coming in and getting heated up, and when it comes out it's a mixture of gases, depending on how hot they make it, right?

The hotter they make it the heavier the gases come off. Well, they don't want it heavier than, like, butane. Pentanes in some cases they'll go that heavy, get the C-5s. That's a C-5 carbon thing. Methane is C-1, one carbon. Ethane is C-2, propane is C-3, butane is C-4, pentane is C-5. They do make a few special things out of pentanes, but mainly through butane.

Then they separate those three gases. That's why refineries are so big, you know. They separate them by boiling-point differences, you know. They can design a unit that you'll have a mixture of 50 percent methane and 50 percent ethane, and you can separate those things into 99.9 percent purity coming out of the top, 99.9 percent purity coming out of the bottom, what's called fractionating columns. A lot of them in refineries.

So they do that. You separate the light components. Then they'll have a gasoline component, which contains a little butane, and goes down through boiling maybe

up to four to five hundred degrees Fahrenheit, a mixture of hydrocarbons. It'll go through C-8s. Octane is a C-8 compound, eight carbons, okay. There are different kinds of octanes, by the way. This is chemistry.

JT: This is liquid form?

HH: Yes, that would be liquid, yes, right. And butane will dissolve in, it's contained into gasoline because it's absorbed by the rest of the hydrocarbons, to a certain extent, okay? But there's very little butane in gasoline. If there's over 2 or 3 percent I'd be surprised, because it vaporizes easily. You don't want to lose it.

JT: So you have one refinery that does all of these different things to the oil that comes in? In other words, separating the carbons and making it useful for other—

HH: Yes. Generally they all have that, the steps I've described. All refineries have that.

JT: Now, where does the petrochemical aspect come into play, when you're making synthetic fibers and rubbers and—

HH: Stuff like that?

JT: —some of the others.

HH: Well, benzene is one of the keys to that, benzene. Now, let me tell you about that. There's not a lot of natural benzene in crudes, but there are processes that have been developed, Jason, that will take a component, and again you do that with these fractionating columns. You take what's left after you take the gases off. Let's say you want to make benzene. Well, that'll boil in the gasoline range, so you take this gasoline stream off, right.

After you take the butane stuff off, the next chunk will be a gasoline stream, let's say, go to maybe 400 Fahrenheit boiling point. It contains things that you can make benzene out of. You can convert one type of hydrocarbon, which benzene is a C-6 compound. There are a lot of C-6 compounds in the crude. So you take those, and what's not benzene already, which will be the major part of it, you go through this process called re-forming. You re-forming those chemicals into benzene or toluene or xylene, and there you're talking C-6, C-7, C-8 carbon compounds. You convert them into those, aromatics they call them. That's in the aromatic family, benzene, toluene, xylenes.

Out of xylenes, one of the three xylenes, you can separate out the one you want by fractionation or whatever, maybe. When I mentioned phenol extraction, that attacks just the aromatics. It's amazing, you know. I mean, it'll attract just the aromatics. So you use that property to separate the aromatics out. Then you separate the aromatics by fractionation. Benzene boils first, toluene boils next, xylenes boil last.

Xylene, one of the xylenes, called ortho-xylene, is used to make polyester, which your shirt's made out of probably, or a large part of it.

JT: Really, carbon gas.

HH: Right. Well, it's ortho-xylene. It's one of the aromatics that they extract, can be extracted. They don't all do that, they don't all do that. But if they're going to make a petrochemical, you know, one of the major petrochemicals, they'll separate out the xylenes and extract that ortho-xylene.

JT: Now, you've had a long career in this field, and I understand the technology has changed, and the research and the science aspect has changed. What you just

described to me, were these known equations, and were these known facts in the early forties and mid-forties when you were going to school?

HH: No.

JT: Was this things that they taught you?

HH: No. That's why we have a research and development department, to develop ways to do these things.

JT: Because it was relatively a new industry when you were coming through.

HH: Oh yes. Polyesters are new. Polyesters were developed in the forties, or really became commercial in the fifties, you know, polyesters as a fiber, or film. All your film is polyester; tapes, videotapes, and vinyl. Vinyl is all synthetic. Vinyl is made from—I can't remember now. It uses an aromatic, I think, I'm pretty sure.

JT: Same family as a plastic?

HH: Yes. And then the things like, yes, polyethylene. Polyethylene is a simple chemical, really. I mentioned methane, ethane. Another process that's big is catalytic cracking, it's called. A lot of the crude that comes in, I've described one of the processes where you leach out aromatics, the different chemicals.

But one of the other processes is called catalytic cracking, where they take—now you get into, in this crude you have in a boiling range of, say, four hundred to eight hundred, oils, right, light oils and heavy oils.

You can take those and heat them up, sometimes in the presence of a catalyst. The original ones didn't even have a catalyst. You just heated them up and cracked them, they call it. They called them thermal cracking units, heated up that oil and it would break it down, just the heat, break it down into smaller hydrocarbons like you wanted, you know, put them in a gasoline range. That's what you're after, gasoline-range stuff, primarily, before chemicals.

Then this catalytic-cracking process was developed in World War II, to make gasoline, high-octane gasoline components, which that avgas has to have, a lot of aromatics in it. That was a major development in producing gasoline in World War II, and the catalyst is interesting.

Catalyst is like face powder. It's called fluid catalytic cracking, really. You could aerate this powder and it's just suspended in air. You keep the air going to it, you know, and it's amazing. It's hot. The reactors run like 900,000 degrees Fahrenheit, and they're the huge vessels you'll see in the refineries, big containers, you know. It's just amazing.

When they crack the oil, its temperature—the carbon is deposited on this catalyst. This is moving all the time, the oil coming in and products coming out. It's not just a batch operation, you know, it's a continuous operation. The catalyst flows from the reactor where it's being broken down, the components are being broken down, the catalyst flows out with the carbon on it, still looks like a powder. It feels the same, but it's black.

It flows to a regenerator, which is an even bigger vessel. Air is injected to it, and it's burning in there. The carbon is burning off. Catalyst comes out with the carbon off of it, back to the reactor for new use. All that's going on continuously, you know, continuous flow. It's amazing.

JT: So nothing is wasted.

HH: Only what escapes in the regenerator to the atmosphere, where you're burning the carbon off, yes. We used to lose, to give you an idea how big this was, we used to lose tons a day of catalyst to the atmosphere, despite the fact that we had what they called precipitators to knock that catalyst back.

See, you've got the air coming in and it's the whole thing burning. You're burning that carbon, you've got a lot of gas coming off, carbon dioxide, carbon monoxide. You couldn't climb too high on those units because of the danger of carbon-monoxide poisoning. They'd have signs up there saying—

JT: Sounds like a health risk.

HH: Health risk, definitely. But they control that amount of carbon monoxide. They monitored that constantly and made sure that they weren't putting too little air in, or too much air. Too much, well, they're just wasting energy if you put too much. But too little you could get carbon monoxide, so they monitor that. That's not a problem, the carbon monoxide isn't a problem, except to the operators around the unit. It was at the time, but I think now they've solved that.

And the amount of particulates being discharged of the catalyst that came out, we had electrical devices to knock those down. The catalyst would collect on plates, and then they would shake them once in a while, and they would drop back down into the unit, but some would still escape. Tons a day would escape. But, you know, it's silica alumina, it's like clay, non-poisonous. It's like clay, brown clay.

JT: Well, with all of this new technology and the research and development, it must have been some fierce competition amongst the refineries and also companies for this new technology.

HH: Yes, there's a lot of competition, but that generated the new processes, you know, the cheaper processes. Like we developed, and that's really the success for Amoco Chemicals, was the development of a process to make this component for polyester. We developed a cheap way to make that, and it swept the industry, you know. It swept the industry, everybody, they still use that process. It was a unique process. Okay?

JT: Let's compare the petrochemical industry refineries of the late forties and early fifties, when you were getting dirty every day, let's compare to what it is today. How much has it grown?

HH: Now, see, I've been away from it a long time. But refineries run a heck of a lot more product than they used to. Back in the forties I think Texas City ran maybe 150,000 barrels a day. That's as big as I ever saw it. They run 3[00,000] or 400,000 thousand barrels a day now, 400 forty-two-gallon barrels a day.

JT: When you say run you mean bringing in the crude and converting it into—

HH: They consume, can consume up to 400,000 barrels a day, yes.

JT: And how many refineries are down there, any idea, a dozen?

HH: Well, the Texas City is big. The Shell refinery is that big. The Exxon refinery is that big. Mobil refinery over in Port Arthur-Beaumont is that big, Port Neches. There are a number of them that big. Chicago has one, Amoco has one at Whiting, Exxon has one at Rahway, New Jersey. We built smaller ones when I was there, smaller refineries. We built one on the East Coast, built one at Yorktown, Virginia. But they've gotten bigger, the economics of size, you know, economics of size working.

JT: What did your family think about the work you were doing?

HH: I guess they appreciated the paycheck. [laughs]

JT: Were they intrigued or interested in knowing about all these wonderful new products that you were somewhat responsible for, you know, at least putting some of your time—

HH: Oh yes, sure, sure. You're talking about, well, Rita worked at the refinery for a while, yes. She was a clerk there in the refinery. But yes, you know, moderate interest. I was just working, as far as they were concerned. But there was a lot of camaraderie among the employees, you know. We used to meet regularly with a group, go to dances together and stuff like that.

One of the things I wanted to mention was benzene, when we made the first, I happened to be fortunate enough to be working on the first benzene unit. That's a very carcinogenic compound, they've found now, and when we made the first benzene, Monsanto was making it. You talk about competition and stuff. Monsanto was making it, but there were always friendly relations between the companies, a friendly competition. They knew we were going to make benzene, and they were producing it a different kind of a way from what we were, I think.

But anyway, I knew a guy over there and I called him and I said, "Say, do you guys have some testing equipment that we could measure the quality of our benzene?"

And they said, "Sure. Come on over. We'll show you what we use, or refer you to the standards of ASTM." Have you heard of ASTM?

JT: No.

HH: American Standard of Testing Materials. That's an organization, I think it was the Bureau of Mines in the government. But they publish test methods which are standards used to measure quality of products, products and all kinds of things, metals. Interesting. That's all they exchanged. They had the process, or the equipment that the ASTM procedure, which we had, it was public knowledge, you know, but they had the equipment. We just didn't have the equipment to run those tests, little lab tests we were running.

But the oil industry exchanges a lot of products. For instance, when you buy gasoline you don't know where it's coming from. If you buy Shell gasoline, we may have made that in a Texas City refinery, BP may have made it or Exxon may have made it. [laughs]

Like let's say you have a plant in Texas City, and you have a customer in New York, and that guy in New York may have customers in Texas. We'll supply him, we'll supply your customer down here, and you guys supply our customers up there. That's why they have ASTM standards, so that when we exchange products we know that we're talking about the same quality, okay.

Now, they may have special additives that they do, something like that. Like somebody advertises that our product contains Techron. Who is that, is that Shell or Exxon? Yes. No, I don't know how they handle that. They may add that in separately to their mix, you know. But there's a lot of that.

JT: Now, in the early days, as you mentioned, there was a lot of wasteful resources, and, of course, that improved over time. So I'll assume that there was some safety problem. Now, were there some accidents as a result of this early development?

HH: Well, the biggest thing I can remember, the biggest accident I can remember, of course, is the Texas City disaster. Remember that thing, petrochemical industry, Texas City disaster? When was that? I was in college, so I think it was in 1947, Texas City explosion. They were unloading a nitrate plant, a nitrate product coming in by ship at Monsanto, and it's a fertilizer-type chemical. It can be explosive under certain conditions.

And this ship exploded down there, and exploded another ship down there, and just blew the chemical plant, just destroyed the Monsanto chemical plant. And there was a lot of loss of life. Yes, there was like, you can look that up. That was like, oh, hundreds and hundreds of people were killed in Texas City, 1947.

JT: What was the cause?

HH: Mishandling of that product that they were bringing in, that raw material they were making something out of, I forget.

Tape 2, Side 1

JT: This is an oral history interview with Herb Holdridge, tape two, on August 4th, 2006, by Jason Theriot. Herb Holdridge on the Port of Houston, the ship channel.

HH: Okay. I'm thinking of accidents, you know, things that happened. To answer your question, I guess I'm getting at it. I can remember one time a guy disappeared, a guy working for our lab disappeared, and it was on a night shift. He'd gone out to get a sample from a tank. On top of the tank there are hatches. You open the hatch and you put a container down on a rope, get a sample of the product and pull it back up, and bring it into the lab for testing.

So they sent a guy out to this tank looking for this fellow, and there was a hole in the top; the top of the tank had given way, and the guy had fallen into something like about 180-degree oil. You don't swim in oil, you sink right down. That's corrosion, so corrosion became a major problem for everybody in the industry, and is a problem. I mentioned that there was a whole little division that made chemicals to prevent corrosion, and that's significant.

Another problem with accidents was getting poisoned by hydrogen sulfide in the oil fields. When you produce crude, one of the gases that comes out is hydrogen sulfide sometimes. It occurs in water even, in water wells. Some of the water wells that are kind of a distasteful taste to you, contain hydrogen sulfide, and it smells, stinks, you know. They actually use a sulfide in methane, natural gas, and that's why you can detect it when it's leaking in your house. You can smell it. That's what you smell, you don't smell methane itself. The pure hydrocarbon, you don't smell it. So they add a chemical to it so you can smell it.

Well, hydrogen sulfide is one of those chemicals, the most basic, but it occurs naturally in a lot of crudes. Most crudes contain sulfur, and that can lead to formation, when you're processing the crude, can lead to formation of acid, you know, sulfurics-type acids, which are very corrosive. So sulfur-containing crudes were not the good kind of crudes. They weren't what they call sweet crudes. You like to run sweet crudes. They were kind of absent of, or very low in sulfur.

But as the availability of crude decreases, you know, you had to use more and more high-sulfur crude, and that required different kind of processing to get rid of that sulfur, and a process was developed to do that, you know, take the sulfur out, take the hydrogen sulfide out.

JT: Now, did you guys live around Texas City when you worked there?

HH: Yes.

JT: Explain to me a little bit about how the growth of the infrastructure around Texas City and the ship channel, meaning bridges and roads and interstate. Did you see a tremendous growth in that decade that you were living there in these areas?

HH: Infrastructure, yes. Oh, I don't know, highways maybe. I guess when I was there the second causeway was being built to Galveston, connecting—Texas City is only fifteen miles from Galveston by car, and that was a major thing. I-45 was in development, going to Galveston. That used to be a two-lane road.

And traffic, you know, I guess the employment in the refinery was varied, you know. You'd think that it took so much manpower per barrel or something like that, but it didn't. A guy could run a huge unit, and if he had a small unit you'd still take the same number of people to run a small unit. So the growth in the oil industry, to an extent, wasn't all—you know, like if we processed a hundred and you went to four hundred, you wouldn't have four times the number of people hired that you had before. You might have half more, or something like that. So there wasn't a dramatic increase in personnel.

But they did, you know, housing. There was a gradual growth. When different processes were put in they required different operators in the refinery, to operate that little separate unit. To that extent there was growth, so there was growth and more housing developed, stuff like that.

It's interesting to me that the development on the ship channel itself was so intense, you know. The availability of the refineries there, with the raw materials to make things, brought other plants in, plastic plants and rubber plants, and components for rubber. Whether they made the rubber or not, they had to make

the components, and a lot of the components were made there, if not the rubber itself, all based on petroleum.

Polyethylene, I was going to tell you about polyethylene. That's very common plastic, and it's just like, it's a C-2 compound with methane and ethane. Ethane, if you take a couple of hydrogens off the ethane molecule you have ethylene, and from that you just, with a catalyst in a process you tie those molecules together to make polyethylene. That's what polyethylene is.

But that's big, and that takes ethylene, right? So you've got to—processes were developed to take that component of the gases that come off ethane, and that you produce in the refining, to make ethylene from that thing, to take the hydrogen off, de-hydrogenation processes. Okay, go ahead.

JT: Now, at what point in time did the United States become dependent on foreign oil?

HH: Boy, I don't know. You've got to talk to somebody else. When I was at the refinery we didn't process—we did process a little foreign oil back in the forties and fifties when I was there. When I left there, what, '58, we were, but it wasn't a large chunk by then. Foreign exploration was in its heyday, you know, and development, but I don't know when that switch occurred. But you know, that data is available.

JT: Was it a similar substance compared to what was coming out of the gulf?

HH: Yes, oh yes. You mean the domestic stuff?

JT: The crude coming from the Middle East and Africa—

HH: Oh yes.

JT: —and compatible with what's coming out of the gulf.

HH: Yes.

JT: Was it the same kind of crude?

HH: I'm not too familiar with that. You've got to talk to somebody else about that side of it. I think the stuff they got out of the Middle East was premium oil, you know, probably low sulfur or something, I don't know. I'm just not too familiar with that, with the difference. I think the gulf, you know, it's coming out, it's probably different. I suspect it's different than the stuff—the stuff you make, you get down real deep, is probably a little different than the stuff you get not quite so deep, but I don't know to what extent it is.

JT: Well, let's talk about the back end of the industry. What happens when you finally have a finished product? How does that leave the refinery and get out to the marketplace, or to the next?

HH: Well, it's networks, it's networks of pipelines. We got a lot of crude in by pipeline, and some by tanker. Of course now it's largely by tanker, I'm sure. And products went out by pipeline mainly, in our refinery. We had no loading, which the refineries around here have, loading of transport tankers, you know, little tank trucks. We didn't have that. We shipped everything at that refinery, shipped everything out, all of the gas—well, I shouldn't say everything. But we shipped a lot of stuff out by tanker.

We shipped a lot by pipeline, too, and that became more and more prevalent, to the East Coast. And I was telling you that you can ship different things in a

pipeline, one behind the other? They can put what they call pigs behind products. It's a device they put in the pipeline, and you move the product ahead of it, and it separates it from the product behind it. Sometimes they didn't even use that. They just put product in behind it, and it just kind of moves as a front.

There's mixing, there's some mixing, but they're continually testing it, and when it starts going off spec they divert it to another tank and separate all the stuff that's off spec until a new product comes in, and then they divert it. Then they take that stuff that they've rejected and send it back to the refinery for separation again. Unbelievable, isn't it?

That way they use the pipelines fully, I mean all the time. Yes, most of the stuff went by tank car and pipeline out of it, pipeline 90 percent probably. It's a great pipeline network. Ethylene in the petrochemical industry became so big a thing, for polyethylene and polyester, that they built ethylene pipelines from the producing plant to the consuming plant, the plastic plant or fiber plant, and they started tying these ethylene pipelines together so people could exchange ethylene. They called it a spaghetti bowl. Have you heard that term?

JT: What do you know of the Texas spaghetti bowl?

HH: Yes. Well, I've just described what they did. They kept tying it in. I worked on a project on the company when we got into the ethylene business, when Amoco got into that, and we got big ethylene production at Chocolate Bayou down here, and in Texas City, ethylene plants just to do that, make that ethylene. That led to this spaghetti bowl thing we're talking about, for just ethylene.

I haven't heard it referred to that for crude, but it is. I mean, I'm sure there's got to be a big network for crude, and a network for refined products like gasoline,

where they can ship gasoline, whatever they want, jet fuel, separate them either with a device, or mix them.

JT: Well, and fascinating to me—

HH: Oh, let me tell you. The ethylene spaghetti bowl goes from here—ethylene is stored largely—well, ethylene is very volatile, it's a little bit heavier than natural gas, but they store it in salt cavities, underground salt domes, they call it. There are a lot of salt domes along the Gulf Coast, and they go in and they wash the salt out and dispose of it in the ocean.

Way underground these things exist, and it creates a storage area for them, and they put gases in there. You know, they store ethylene in there, and they come out with pipe, go in with pipelines, come out with pipelines, and they store tremendous quantities of this stuff, you know.

The pipeline runs clean down—our storage areas were down near Freeport, domes, so the ethylene network ran from there, and it's probably tied in further now. It ran from there to Beaumont-Port Arthur, and I'm sure it's tied in now to Baton Rouge area. Lake Charles, went to Lake Charles. Who's at Lake Charles, City Service or somebody? Yes, it went to Lake Charles, because they made ethylene.

JT: It's going down the pipe, doesn't it?

HH: Yes. You could input to it and take out of it.

JT: What has amazed me about human ingenuity and engineering was the development of what they refer to as the Big Inch and the Little Inch, which was a

big pipeline developed during the war, that sent crude oil or gasoline products and aviation fuel from Port of Houston to the East Coast.

HH: Right.

JT: Because of the threat of the U-boats in the gulf and along the Atlantic, they figured this was a safer way to transport the material.

HH: I never thought of that, but that's true, sure. That's probably contributed to those developments, yes. Right, it makes sense.

JT: What are these terms? Feedstock. What does that refer to?

HH: Raw materials, primary raw material, like crude is a feedstock for refineries. You wouldn't, like auxiliary things that are used, like gases and things that they use in the processing, you wouldn't call it a feedstock. The crude's a feedstock. Feedstock for an ethylene plant could be different things. It could be the ethane, that is the simplest one I described, but you don't have enough ethane naturally available to satisfy the ethylene demand.

So I mentioned cracking molecules to make, like, gasoline out of oil, I mentioned that fluid catalytic cracking process with a powder-type catalyst? They developed similar processes to make ethylene, to make more ethane so you could de-hydrogenate it to make ethylene. That's a pretty big little, can be a big operation, too, in terms of equipment, to do that, processes. In that case, for ethylene, feedstock would be ethane. It could be a mixture of gases that they crack. Feedstock is a general term, like the major raw material.

JT: And what do they mean by the downstream industry? Is that the petrochemical industry?

HH: Yes. If you take a refinery, well, take the petrochemical industry. Upstream would be the refinery, giving feedstocks to the petrochemical industry. Downstream of a refinery would be the petrochemical industry, would be gasoline consumers, distribution, you know, the products itself, that's downstream. That's what it refers to. Upstream of either the refinery, or downstream, products from the refinery, operations associated with that. You're going to be an expert.

JT: Yes, sir.

HH: Hey, had you heard about that library at the Chamber of Commerce on the Port of Houston, or the ship channel?

JT: I've not; I will look into that.

HH: Yes. That's supposed to be a good source, because I called the guy that I know worked for *Petroleum Refinery*. He was in publishing. He worked for the Gulf Publishing Company, I don't know if you've heard of them, put out *Petroleum Refinery*, a strictly petroleum-refining-type technical magazine put out monthly.

I worked with him in Texas City and I called him about your project. I wanted you to interview him. He's over at Canyon Lake. But he didn't want to. [laughs] No, he's the one that mentioned that he was on a team that did some research on the Port of Houston, and he said all that stuff's in the library there at the Port of Houston, the archives at the Chamber of Commerce.

JT: In 1926 the Port of Houston ranked eleventh in U.S. tonnage and size. Today, this is the largest in the Western Hemisphere. What explains that tremendous growth in seventy-five years?

HH: Of the Port of Houston? Gosh, I don't know. Entrepreneurs that wanted to invest in the thing, I guess; NASA locating in the area. I'm just wondering, thoughts that hit me. Katrina eliminating New Orleans. [laughs] New Orleans is back, coming back, I guess, the port, because there's a lot of supporting industry in New Orleans area. They're not going to abandon those petrochemical plants and refineries, so they'll come back there.

Cheap labor maybe, cheap land, compared to the East Coast. I mean, we ship tremendous quantities of stuff from this refinery to the East Coast, right? They can get crude just like we can on the East Coast, and have refineries and stop all that shipping, but I think land has been relatively cheap here, compared to the Northeast or California. Cheap labor, maybe, close to the Mexican border.

A deepwater port, no doubt, and the channel access to all of the plants here is contributory. Air, you know, major airlines come in here, major rail routes. But those could have developed anywhere along the Gulf Coast, you know. Why?

JT: They could have, particularly in some of the areas that are natural ports, like Fourchon, like Galveston, like Port Arthur, some of these areas. Why didn't this major industry—

HH: Locate here. Well, Louisiana had a lot of crude. Texas had a lot of crude. Those were natural places to put refineries. Before all of the pipelines were constructed, they could send it anywhere, so I think that initially contributed to, just the availability of the raw material, the crude here in Texas, you know, before all of the imported stuff started. And once it starts building it kind of feeds on itself. You build a refinery and you need a lot of supporting stuff, you know.

JT: Texas City.

HH: Galveston Bay is probably—I don't know to what extent the size of Galveston Bay, compared to these other ports, is probably massive. You look at it on a map and Galveston Bay looks pretty big compared to the bay around Port Arthur or Corpus, say. Right? So I don't know to what extent that—but there are limits. What are the limits of growth? I wrote that down. What are the limits of growth? You know, if you get one plant next to another, then you can move further out, I guess, behind the waterfront.

JT: But a lot of the tankers and a lot of the business drives right past Galveston Bay and heads right up the ship channel.

HH: Yes, yes, yes. I don't know. I can't help but think that remembrances of 1900 have impacted what goes on in Galveston. It's so vulnerable, you know, and people don't trust the seawalls anymore, I'm sure. [laughs]

JT: Well, let me ask you this, if you have any input on federal and state legislation.

HH: Those acts you mentioned, I don't know anything about those. I don't even know what the Jones Act is. What is that?

JT: Jones Act was a piece of legislation I believe in the twenties or thirties, which secured the Merchant Marine industry, the American Merchant Marine industry. In other words, you cannot have a foreign-flag ship that transports cargo from Europe into New Jersey, swaps out cargo and then transports that cargo from New Jersey.

HH: Yes, regulation.

JT: Right. It secures—

HH: The maritime industry.

JT: —U.S. maritime industry. Because it is a problem. We are outsourcing a tremendous amount of labor and industries, and a lot of our commercial products, like cars.

HH: I don't like that. I don't like—we're outsourcing, it makes it—

JT: TV, I have a Sony. There's not even American televisions that are being made.

HH: I know.

JT: That's one of the questions that I—

HH: I know that. That was a question, and I thought of India. I called to get a credit card the other day, and I was talking to India. And my son, who works for EDS up at Plano, Electronic Data Systems, used to be owned by Ross Perot, electronic company, he said, "Oh yeah." He says, "They even trained," who was he saying, "Dell." Dell is having one tough problem with that, with their public relations, people with Dell products calling and they get India, and they try to get service. [laughs] And they can't understand the person, you know, and they train them to speak English. They have classes for them, the companies. It's amazing.

JT: Well, you look at Texas City and the ship channel at the Port of Houston, the amount of money, the amount of profit, the amount of regional economy that is all taking place in this area. It's got to become accessible to cheaper, foreign labor at some point in time, and I'm looking at let's say the next fifty years. I know that it's happening now, but is the port going to look the same fifty years from now, what do you think, as far as American-owned companies and businesses?

HH: I don't know. Foreign investment seems to be increasing in the U.S. This outsourcing is kind of bad on employment. I just don't know. I really question the future of our economy with that free trade. I don't know. It's cutting down on jobs. I don't understand how the stock market keeps going up. [laughs] I don't know. We're sure importing a lot of Japanese cars, right, Chinese equipment. What are they buying from us? Nothing. I don't know of any, you know—the balance of trade is way shifted. What's that impact on the dollar, long range? I don't know. I don't know that, I'm not an economist.

JT: Let's talk about the local community and what role it plays in the development of the port and the industry. Why do you think that most people don't understand or realize the significant economic impacts of the ship channel, and what it brings to the region?

HH: Well, I'm not so sure that people don't appreciate that. I think they do. I think they know that Houston's kind of a unique place because of that access to deep water, and sunshine and health and all that kind of stuff, health facilities. I don't know, they don't do a lot of promotion, the Port of Houston, but I'm sure that most of the residents appreciate it, appreciate its significance.

I'm sure that it's a port that's so big because it's convenient, maybe labor is cheap, I don't know. Maybe that's part of it. I think that's going to remain. I think imports are going to continue to rise unless something happens to stop it, and it's going to contribute to the growth of tonnage. But I just don't know, I'm out of my field there, buddy.

JT: Well, we are seeing a significant increase in the consumption of oil—

HH: Goods.

JT: And as you just described, the numerous other materials that are used from oil, that we use every day, and take advantage of that fact. And obviously, the Gulf of Mexico does not provide us with enough, and we have to depend on foreign oil. But what do you think is the future, the next fifty years? Do you see it as a necessity for us to design and build new refineries in this region?

HH: No. I think with the demise of oil you're going to see the Prius-type automobile prevalent. I really do. I mean, crude has just been so available and so cheap relative, you know, that we haven't had the incentive to develop other technology. But my son drives a Prius and gets over fifty-five miles a gallon. I think that's the way to go, and it's a nice, comfortable car. I've been in it. Just better utilization, efficiency of energy is the way we're going, and less and less dependent on oil, less and less dependent on the refineries. I really do.

Coal may become more and more important as a fuel. The Germans used to make gasoline out of coal till World War II, very expensive, you know, compared to crude, even at three dollars a gallon, or what's crude, seventy-four dollars a gallon? Yes, it's still cheaper probably than making it out of coal, but we've just got to have some other resource. There's only a limited amount of crude, and we don't know ways to make crude. So there might be different types of refineries, you know, things that process coal.

JT: I think we're headed that way at a very, very slow pace, but at some point something is going to happen that is going to jumpstart that operation, that program. Any ideas, any thoughts on what may be something that sparks a fire for us to look into moving in that direction?

HH: Other than a big fire in the Middle East, you know, escalation of the problems over there. If they cut us off we're in big trouble, and that could happen. The clash of cultures there is a real problem. I don't know what the answers are, and

our politicians don't know. You know, nuclear is certainly a way to go, nuclear energy, but I think you're going to see less and less gasoline consuming, and more plugging into things that run around, electric cars type thing.

And powering the electricity plants will either be nuclear or coal, or solar, but that solar is so limited, you know, unless they have developments in that technology which make it more available, just to produce more product, horsepower, I don't know how.

JT: Well, a good example of how we are so dependent, in the eighties when they had the big oil crash, what type of effects did that have on you, for example, and in the area where you lived; do you recall those days?

HH: When we had to get in line to buy gasoline? Yes, I recall them. We just cut back on travel, you know. But it was sad, it was sad. But those could come back. I think in the Houston area in general, I don't know if this impacts the port, but I really think we need a rail, you know. Big cities I think should have rail. Pollution is a problem. Using cars is an inefficient way to move, you know. I don't know. It's going to be a different world, though, in a hundred years, fifty years.

JT: Well, and I think it's a different world now, if you look at what happened on 9/11 and then our close miss with Hurricane Rita, it really makes people stop and look at what's going on—

HH: How dependent we are.

JT: —and how volatile this industry is, really. You know, one big storm like Hurricane Rita and we might not be doing this project today.

HH: That's right. How long is this project going to go? I mean, does it have an end, your project? Do you have a time limit?

JT: Well, there's *x* number of interviews and then they're going to, the way that I understand it, they want to also look at other ports, like Corpus Christi, Houston, Port Arthur, and probably Port of Fourchon, New Orleans, Pascagoula, they're interested in the impacts on those areas. And certainly as you can attest to, it really has made a tremendous impact on your life.

HH: Yes, right.

JT: Well, Mr. Herb—

HH: I enjoyed it. I want to give you the name of a guy that you might contact. He's an interesting guy, he's a geologist, and he'd tell you about the offshore impact of, you know, knows more about crude than I do.

JT: All right. I'm going to shut this down. Thank you.

[End of interview]

[Edited by Jason Theriot, 29 November 2006]