Oral History of Michael (Mike) A. McNeilly

Interviewed by:
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Craig Addison: If you could you start at the beginning and talk about your involvement or entry into the semiconductor business. How did that happen?

Michael (Mike) A. McNeilly: You want to go that far back?

Addison: Yes. Just briefly.

McNeilly: Prior to founding Applied Materials I was with Union Carbide's Silicones Division [in Buffalo NY] and Union Carbide was supplying trichlorosilane to the large producers of polysilicon. And I went to work for Carbide right out of graduate school. They had problems with validating the quality of the trichlorosilane (TCS) and that was my original responsibility at Union Carbide in Buffalo. And I then visited their TCS facility in Sistersville [West Virginia]. They were actually shipping trichlorosilane to Monsanto, Dow, General Electric and TI by railroad car. For every five cars of TCS they'd ship they'd get three or four back, rejected at the point of use [because of contamination]. So I built a small, intrinsic reactor for them at the West Virginia plant that gave them the ability to evaluate the TCS tank cars before they left so I had some figure of merit. But in doing that and working with all the poly suppliers I became very enamored with the chemistry of silicon and silicon precursors for their potential future manufacture of integrated devices – transistors, at the time. That was in 1964. I left Union Carbide in 1965 and moved to the west coast and started Apogee Chemical. Apogee was started with a partner who was from the organic peroxide, free-radical catalyst business for polyester resins. We had about a seven acre facility in North Richmond and I took half the facility for the production of trichlorosilane and silicon tetrachloride and other precursors for the manufacture of semiconductors.

Very early on at Apogee, I became involved with Fairchild which was really the fountain head of the leading edge of IC technology at the time. And that's where I got to know Gordon Moore and Bob Noyce and a lot of the guys that were working on the line. I wound up playing basketball for Fairchild. That's how I really got to know the production process guys. The Wagon Wheel, basketball, silicon precursors. Fairchild did a lot of the work for me. I'd bring samples in the back door and go around to the front door. If it was fine, they've give me a purchase order and I'd write an invoice and we'd have a transaction in one day. And from that it became obvious to me that the industry was populated by guys that were very, very smart -- the EEs, a lot of physicists, device and electronic guys. But they really didn't understand chemistry. They didn't understand the handling of chemistry [for processing semiconductors]. And it became obvious very quickly that the future of semiconductor device manufacturing was going to be based on their ability to utilize a variety of hazardous chemicals and other materials for device production and that that was not in place.

I also had a falling out with my Apogee partner in North Richmond so I left Apogee. I started Applied Materials on a $7,000 loan from my father-in-law and some ideas for manufacture of equipment and silane, SiH 4, which was going to be key to the lower temperature deposition of many CVD films. So I demonstrated the ability to do that -- how to handle the materials. And that led to Applied.

Addison: Before we move onto Applied. Apogee was specifically supplying the semiconductor industry?

McNeilly: Yes. Apogee was formed, in part to supply ultra high purity chemicals to the semiconductor industry for the manufacture of transistors, power devices, and eventually the first integrated circuits in ‘64, ‘65. So there was a need for these ultra high purity chemicals. But there was also a need for the ability to handle them and handle them in the right way, which the industry was certainly not doing.

Addison: And Union Carbide, that was separate from Union Carbide Electronics that Jean Hoerni started?

McNeilly: Exactly. Jean Hoerni was on the board of directors [of Applied]. And then Jean Hoerni had formed Intersil, and I hired Walt Benzing from Union Carbide Electronics. Jean was the investor of the planar process, the basis of which all production devices are made today.

Addison: So Jean Hoerni was on the board of directors for Apogee?

McNeilly: Applied Materials.

Addison: At Applied, you were talking about the chemistry side. Gordon Moore was also a chemist.

McNeilly: Chemist-physicist, I believe.

Addison: Did you talk to him a lot about this?

McNeilly: Yes. Gordon was very helpful and this preceded the time that Intel was formed after the team left Fairchild. But Fairchild was certainly the leading edge technologists on planar technology. MOS was just starting to be considered, MOS device structures. Gordon was running Fairchild R&D at the time and Bob [Noyce] was general manager of Fairchild. And Andy [Grove] was somewhere in the middle of all of that keeping everybody moving as usual. And then in about 1968 the semiconductor industry really started to move. Many companies were being spun out of Fairchild. Charlie Sporck, who was the general manager, went to National [Semiconductor]. Jean Hoerni left Union Carbide and formed Intersil. And the valley just started being populated with newly funded semiconductor device manufacturers. From '68 through '72, I think there were 32 new device manufacturers, new integrated circuit manufacturers started in the Bay area.

Addison: So was that something you said, that there needs to be a company that supplies these new device start ups?

McNeilly: Yes. That blossomed the expansion. I didn't anticipate that much expansion that quickly. But there were no other suppliers to provide what we supplied at Applied Materials. And there were a whole series of new films that were coming on the scene. There was silicon dioxide, low temperature, low temperature epi, silicon nitride. So every new film that came along, we were always ahead of the curve and we responded very quickly. We dominated the market. Actually Bill Hugle was in the space before we started but we managed to overcome Bill and I think Hugle Industries left the business in 1971.

So [in 1967-68] there was no definition for the market at all. There was nothing…you couldn't point to anybody and say, “This is a one million dollar year market.” There were only two suppliers in the space that I knew of -- Hugle Industries and Echo Labs in New Jersey.

Addison: During the Apogee Chemical period, were there any breakthroughs in technology or any memorable stories that you can recall from that period?

McNeilly: Apogee became known as the first supplier of silicon precursors -- chemicals for depositing silicon and silicon compounds -- certainly on the West Coast. Union Carbide withdrew from that business. They really didn't understand it. Matheson Gas was just starting to get into the business. When I left Apogee and started at Applied, one of the first things I needed to do was demonstrate that I could produce and handle silane, SiH_4, which is an explosive pyrophoric gas. And everyone…the people in the industry I was talking to certainly saw the benefits that silane brought in lower temperature depositions -- oxides at [less than] 400 degrees, lower temperature epi. But everyone was terrified of how to handle it in production. How do you handle this dangerous gas? They were having a difficult time just handling silicon tetrachloride and TCS.

So I built a small silane plant in East Palo Alto and had the guys from Fairchild come by. And I remember them being terrified by it. I pulled the [LN 2] dewar down from the condensation flask and here was about a liter of pure liquid silane in this quartz container. I felt it was necessary to demonstrate my prowess to safely handle hazardous chemicals. They quickly exited. And then [those who were] present started

placing orders for equipment to…use the gas and other gases to deposit films. Then the equipment business volume just outstripped the chemical revenues. Applied never manufactured the chemicals.

Addison: So this silane plant, that was when you were with Applied or Apogee?

McNeilly: Applied. Right. The first thing I did when I started at Applied.

Addison: Well maybe we can move onto Applied. You said that you got a loan of $7,000?

McNeilly: $7,500 actually.

Addison: $7,500. From your father-in-law.

McNeilly: Yes. Correct.

Addison: How far did that get you? Probably not very far.

McNeilly: It got us incorporated. Got me into a 750 square foot building in Mountain View on a month-to-month basis, and car expenses to commute from Marin County where I was living at the time. I was the only employee for the first three months. I pretty much started Applied on my own.

Addison: What was the very first product?

McNeilly: The very first product was an automated SiH 4 gas panel. It was the first product that I know of in the industry that used the Nupro bellows valves and an all welded assembly so that there was no potential for gas leaks. Everything was helium leak tested. So that was the first product. And that went into some systems that were in place that were depositing epi silicon films at higher temperatures. And then we built one of the reactors at Fairchild with that panel. And we demonstrated the ability to deposit low temperature oxide films safely.

Addison: I believe Gordon Moore put in money for Applied…

McNeilly: Gordon, Andy Grove and Bob Noyce were all investors -- early investors. As was Jean Hoerni, Charlie Sporck and Tom Bay.

Addison: At that time there were very few independent equipment companies, correct?

McNeilly: The only two that I knew of were Hugle Industries and Echo Labs that were strictly equipment suppliers.

Addison: So at that time were the device makers thinking, we need the support of an external [equipment] industry?

McNeilly: No, they did not. Initially the big guys -- IBM, Western Electric, Bell Labs, Motorola, Texas Instruments, Fairchild -- they dominated the landscape at the time. And they all had internal [process development] capabilities. None of them were receptive to anything we came up with. At the time, the technology of film deposition for the production of integrated circuits was very, very proprietary. We had an extremely difficult time, but fortunately, all of these new semiconductor companies were spawned in the Valley and they didn't have any internal capability. So they became the proving ground for the technology that we were developing. The first real breakthrough with the big companies came in '71 when we had invented the infrared epi deposition systems which completely revolutionized the deposition of silicon films and other high temperature films, and really gave us the name in the industry of being an

innovator and having that kind of capability. So really with that tool we completely leapfrogged anything that was being done within any of the major manufacturers. And that got us in globally.

Addison: Do you remember your first customer?

McNeilly: Sure. The first customer was Fairchild buying silane gas panels for delivery of the gases at Fairchild R&D. The first customer to buy a [deposition] system was Jean Hoerni at Intersil. [Another early] customer was a company called Microwave Associates. I'm not sure they still exist. Then it expanded very rapidly from there on.

Addison: You said that you were basically on your own for a while. Can you talk about how you went out and recruited people into the company -- how and why you chose the individuals you did?

McNeilly: I think I'm probably the luckiest entrepreneur that ever walked through the valley. The early board of directors [of Applied] included T. Walton Storm from General Electric when General Electric invested in 1969. Tom Perkins from Kleiner Perkins. Jean Hoerni. Bob Noyce was on for a while. Tom Bay . Fred Adler, who started Adler Associates and became a well-known financier in the business. I was only 28 at the time…and surrounded by mentors of that caliber. The venture industry was very different then. That was my board. But when we started there was a transition that had to be made obviously from $7,500 to something. So I did an initial round in financing in which I got key guys in the industry that were very knowledgeable in what was going on -- like Bob [Noyce] and the guys at Intel and Fairchild -- to invest [in Applied], which was an endorsement of what we were doing. And then I went to Wall Street and had a very bad experience with a Wall Street firm. And fortunately Bob Noyce and Fred Adler had said that if that deal didn't go through to call Fred. And Fred and I signed a letter. I hadn't met him, but spent an hour at the bar at the St. Regis Hotel [in New York City], signed the same investment memorandum that the other firm [in New York] had turned down, and Fred was out the next week with a $400,000 cashiers check. And that was the beginning. But prior to that, prior to having the money in my pocket, I had hired Herb Henderson, Walt Benzing, Joe Nava, Jim McDermott, [all] fairly senior guys in the silicon business or the device business.

Addison: They were mostly from Fairchild?

McNeilly: Mostly from Fairchild. Walt was from Union Carbide Electronics. One of the reasons he left was Jean Hoerni had also left and formed Intersil. Most of the hires were from the industry.

Addison: Was it a big risk for those guys to join you?

McNeilly: Absolutely. They thought we had the money. I thought we had the money. It turns out I go to New York and the Wall Street firm [F.S. Smithers] changed the deal at the last minute and then I walked out at the last minute. I didn't have enough money to fly out or back. It's a great story. The investment firm that we had been negotiating with for about four months had [agreed] to a deal and I had executed the stock purchase agreements. In those days the investment docs were only about 10 pages. Then I get a call from the guy in New York and he said, “There is one more formality. You have to come to New York ; meet the chairman of the investment committee. It's just a formality.” I said, “Hey, I don't have enough money to get to New York .” He said, “You're an entrepreneur. You'll figure out how,” and hung up the phone. I called Tom Bay and Bob Noyce and they came over with a round trip ticket on United [Airlines] and two $100 bills and sent me on my way.

Then I got there. They changed the deal. And I just said, “I can't do business with people like that”, and walked out. Now I go back to my hotel. This is the deal that we'd been talking about for six months and that all my people [Benzing et al] thought was a slam dunk, a certainty; they'd all left their jobs. They're sitting back in the Mountain View office waiting for me to call. And I couldn't meet with Fred [Adler] until 6:00 that night. So when I called them they said, “What the hell happened?” I said, “The Smithers deal, the first deal, didn't go through. They changed the deal. I walked out on them.” There was silence from

Benzing and all the others who left their jobs and all have young families. Most were 10 to 20 years older than me. They're all sitting around the speaker phone. I said, “But don't worry about it. I just met a guy at the St. Regis bar and he signed the documents. He's coming out next Monday with a cashier's check.” I've never heard such deafening silence. He [Fred Adler] did come out on Monday [with the cash] and that really got Applied launched. It's an incredible story.

Addison: Yes.

McNeilly: An interesting footnote. The company that turned us down, that 31 percent of Applied that they would have owned, cost them at the time AMAT went public two years later --- close to $14 million for a $300,000 investment. If they had held the stock longer term…they failed to earn about $40 million in seven years. I met the investor at La Guardia [airport] one day. They lost about $40 million in seven years. And now they're out of business. So there are some victories.

Addison: So you had the money in the bank. What happened after that?

McNeilly: I paid off the third mortgage on my house. That was the first thing I did. Then we moved from the 750 square feet in Mountain View office to right across the street from National Semiconductor in Santa Clara on San Ysidro Way into a 15,000 or 18,000 square foot building, and that was really the beginning of Applied. As a company, in that facility, we grew to maybe 100 employees and revenues of about $10 million a year.

Addison: Can you talk about some of the early product developments?

McNeilly: Sure. We started out with small reactors -- basically it's called a pancake reactor -- and demonstrated the ability to deposit a number of CVD films at lower temperatures using silane chemistry [and] demonstrated the safety of it. We incorporated the old PDP8 Data General computer, so we had a fully automated system. And that was for silicon epi. Very shortly after than we then went to deposition of gallium arsenide, some of the compound semiconductors in the same tool. And right away we started looking at the lower temperature oxide depositions. We coined the trademark, “Silox”. And then there was “Nitrox”, which was the nitride passivation film for the plastic encapsulation of integrated circuits. So we pioneered all of that. Any film that came along…light emitting diodes became very prominent in the early ‘70s and there were five or six companies that were started to produce gallium arsenide phosphide light emitting diodes. And we built many systems for that. Then we came up with the first patent… for the infrared deposition of silicon and other materials, which really revolutionized the industry [for] deposition quality and slip free, dislocation free epi.

Addison: So that was your first patent?

McNeilly: Yes. Right.

Addison: You have about 50 patents?

McNeilly: 25 or 30. Something like that, and a number of international patents but they're just derivatives of the others

Addison: So that was all within the Applied period?

McNeilly: No. I also have patents for ski bindings and ski goggles. But maybe 20, or more, of my patents are related to the deposition of thin film semiconductor production equipment.

Addison: Can you talk about some of the really key ones?

McNeilly: Well, there was infrared deposition at ultra high temperatures.

There was the slip free epi, which was probably the key patent in all of Applied's history in that it gave us the position, the only position in the world to deliver systems…where you can deposit silicon on silicon and essentially [have] 100 percent yields. Prior to that there were always problems with slip and dislocation.

Then we had many process patents. We had patents for silicon nitride deposition using plasma, silicon dioxide depositions at low temperatures. There were probably 12, 14 patents at Applied. But that was not just me. There were obviously other guys that contributed to that.

Addison: You also won one of the very first SEMI awards.

McNeilly: Walt [Benzing] and I were awarded the first significant contributions to the semiconductor industry award, given by SEMI in 1979. And that was for the infrared epi.

Addison: Obviously you're an entrepreneur and a technology guy. Did you feel comfortable running the company, or you wanted to bring in somebody to run the company so you could work in the lab?

McNeilly: I didn't know enough in the early days… Basically, I'm a serial entrepreneur. Since college, the only company I ever worked for was Union Carbide Silicones. All other companies I've worked for I started. And I'm a scientist really, not an engineer. I think the distinction is -- and that's why we had such a great team at Applied -- is that you come up with a very creative, innovative ideas based on science and we had a great engineering guys that could reduce the hardware to practice. I instituted [a policy] very early that any prototype system we built and shipped, we had to install it in the back room in a demo lab. So we had the first demo lab in the industry at Applied Materials. We would go out and talk to somebody that had a need. We'd come back, engineer it, build it, send them a prototype. So before we left San Ysidro we had about 14 tools in the demo lab -- the first clean room demo lab in the industry.

When I started the company I didn't even know what a balance sheet was. In the late ‘70s, '76, '77, I'd had 10 years at the helm [and] managed the company through some extremely difficult times. We had gotten to the rate of about $100 million a year [in sales] but it was very cyclical. And I felt that I wanted to bring someone in that could handle the day-to-day operations of the company. I interviewed a number of people and decided on Jim Morgan. Bob Graham had joined the company as a consultant in the early ‘70s. So Bob gave us a perspective from the device side of the business. He was the first marketing guy at Intel. So Bob brought that to the company – the knowledge of the industry so we could start making forecasts and look at the device market.

And then I brought in Jim [Morgan] in '76, '77 as COO. Once we went public the company had become a very different character from the CEOs [point of view]. So I was drawn away from the market, customers and technology…and we were starting to lose some market share to some other small companies that were coming along, like Pacific Western Systems. And I didn't like that at all. So I wanted to get someone to come in and manage the day to day and the financial aspects of the company, particularly dealing with the financial community. The stock now was down [to about] $3.00 a share [from a post IPO price of $18/share], even though we were doing business up to the rate of about $100 million a year. So I brought Jim in.

Addison: So how did you identify Jim Morgan?

McNeilly: Jim was affiliated with a company called, WestVen [Management] that at the time was the investment banking arm of Bank of America. And WestVen [was considering an investment] in Applied, so that's how I was introduced to Jim. I looked at a number of people. I didn't think the industry guys were right because the industry guys knew the industry. I knew we knew the industry. That wasn't the issue. The issue was, “how do we relate to the outside world, particularly in the investment community?” And

Jim had all the credentials for that. We probably talked for a year before I finally decided to make an offer and Jim agreed to join.

Addison: What about Bob Graham? You never really considered him as CEO?

McNeilly: No, I never considered Bob Graham as CEO.

Addison: He [Bob Graham] has a big name in the industry, and now has a SEMI award named after him. What did he bring to Applied, in your view, as a consultant?

McNeilly: I think Bob was a consultant until after I left the company or shortly before I left the company we made him a full-time employee. Bob was a very smart guy. He was a very good marketing man. He had, like I said, a tremendous knowledge of the device business. That had been his whole life. And so we didn't have that. There were the materials guys and then there were device guys and there was a chasm in between. So Bob really brought that knowledge from the device marketing from the integrated circuit market knowledge and some customer knowledge. Bob and I wrote the first white paper [on the industry] and named it “The Semiconductor Wafer Fabrication Industry”, in 1971. We collected everybody, the few equipment companies and the materials companies into the definition that probably still exists today.

Addison: So what was the purpose of writing the White Paper?

McNeilly: Well, to define the market for the first time. There was no definition of the [wafer fab equipment] market. When I went out to raise money, of course one of the first things an investor asks is, “How large is the market?” I don't know. “How large are your competitors?” Echo Labs is doing a couple hundred thousand a year. Hugle may be doing a million dollars a year. But there was no market definition. Fortunately General Electric made an investment in 1968. General Electric became the largest shareholder in Applied during my tenure and they were an incredible investor. Of course they knew the electronics business. They had a very wise gentleman by the name of T. Walton Storm who sat on our board. It was an easy investment for General Electric to make. They also became the supplier, through their lamp division, for all the infrared bulbs [used by Applied]. So there was a very symbiotic relationship.

Addison: So that was '68.

McNeilly: '68.

Addison: One year after you started.

McNeilly: '68 or '69. They came in '69, I believe.

Addison: How did you get hooked up with GE?

McNeilly: About a year after we closed the first venture we were running out of the cash round of $380,000. I had met a gentleman by the name of Laurent Michel, who was the managing director of a [financial service] company called Paribas headquartered in Paris …at the time he was managing the Paribas Venture Fund and he had a relationship with the General Electric venture capital fund. He wanted to invest. And he introduced me to General Electric. So in that second round, General Electric and Paribas invested, [as well as] Kleiner Perkins. And that turned out to be the key. That saved my butt. Saved Morgan's butt later. General Electric [had] deep pockets. Great gentlemen. And then they made a lot of money and they stuck around [as investors] for a long time.

Addison: You indicated before that Applied started out as a materials company, or at least that was the thinking.

McNeilly: No. I'd like to make sure that's clear. I always looked at the materials and chemicals business as being dominated by large suppliers, large corporations. The vision I saw was that the industry was evolving and was limitless as far as its potential [but] didn't understand the handling of materials and chemicals. They weren't comfortable with those processes that were fundamental to their existence. The production of the silane chemical was just to demonstrate my credibility and my ability to handle these gasses and chemistries. The ultimate gas and ultimate chemistry. It was never a vision for Applied to be a materials supplier or a chemical supplier. It was just a means to an end.

Addison: So the name change [from Applied Materials Technology to Applied Materials], did that happen while you were there?

McNeilly: Yes. That was kind of a funny story. The investment bankers we had chosen [for the IPO] was Robertson, Coleman, Sieble, and Weisel here on the West Coast.

And we were having a meeting at Orrich Herrington. I had retained Orrich Herrington at the time [as corporate counsel] for the public offering. We were all sitting around the table and we were drafting this S1 document. Everyone was tired of writing Applied Materials Technology, Inc., so I wondered if we should shorten it to Applied Materials. Does that adequately describe the company? So I made a decision on the spot. Let's do Applied Materials, Inc. We'll drop the Technology. The board didn't know about this until the time that we were actually going to go public. In those days, the CEO and the secretary/treasurer and all the officers of the company went back to New York , and we executed stacks of documents. At that time the lawyers in New York carried the executed documents to the SEC…you also had to apply the corporate stamp to all of the documents. Well, somehow we had forgotten that we legally changed the name. We get back to New York . The directors didn't know about this and of course General Electric and everyone else is at this ceremony. And they pick up the S1 and the first thing they say is, “You've got the wrong name on the S1.” And I said, “No. It's the right name.” They said, “Why in the hell did you drop the ‘Technology' from the name?” And I said, “It's just more applicable and it's not as cumbersome.” And they were really upset. But the thing that really upset everybody was the stamp, the seal that we had taken from here [California] to New York to seal the final documents. It had the old name on [the stamp]. So when the documents went to the SEC, the first thing the SEC says, “The seal says Applied Materials Technology, Inc. The legal name is Applied Materials, Inc. Who are we taking public here?” So all the documents had to be all redone. We had to make a new corporate seal in New York . That's probably the most trouble I've ever gotten in as a CEO.

Addison: I just want to talk about SEMI for a minute.

McNeilly: Yes. Please.

Addison: The story that I've heard a couple of times, and maybe you've heard this, is that Applied was one of the dissenters at the meeting where all the equipment and materials companies gathered to talk about the formation about this association. And I think Bill Hugle tells the story. He's got a written version. And he said it was because Hugle Industries was a competitor to Applied and therefore Applied was one of the dissenters when the hands went up for the formation [of SEMI]. Can you shed any light on that?

McNeilly: I didn't attend that meeting, I don't believe. I know that Walt Benzing was very much involved… Let's back up a bit. I was certainly in favor of, and the company was in favor of some new venue [for a trade show]. The only venue at the time for a show was IEEE in New York City every year. And that was primarily a test and packaging and device show held at the coliseum in New York . It was a grueling 11 day show and AMAT went three years in a row. And it was just killer. There was very little traffic that had anything to do with device manufacturing. It was all applications, aerospace, military, electronic stuff. So we were a fish out of water there. But from the first year on we were talking about what could be done but it didn't appear there was enough critical mass to have what occurred happen. We were always somewhat cantankerous as far as [competing with] Hugle. There was a lawsuit that took place. That may

have been pending at the time against Hugle Industries, in which we prevailed. But it certainly wasn't anything personal and I really don't know the answer to that.

Addison: Somebody told me that the Applied booth at the IEEE was right next to some stamping machine and that was one reason why you didn't like it.

McNeilly: There were a million [reasons]. Yes. They were stamping lead frames next to us. It cost us more to just deal with the unions. It was a nightmare. It was absolutely a nightmare. We would have people walk by and they thought we were showing new kitchen appliances. It was amazing. Very expensive. Eleven days. You had to man the booth every day.

Addison: So what about other competitors? How quickly did companies start to move into your area?

McNeilly: The first company that came along that gave me pause to understand that I had gotten away from understanding the market… was Pacific Western Systems. I was very heavily involved in the market technology interface and new product development. After going public in the fall of '72 I was really drawn well away from that interface. [Up until then] we had all done so well in understanding the needs [of the market], translating those needs into product, getting the product out in the market place and demonstrating it. A company came along by the name of Pacific Western Systems and they drove a stake into our ground for low temperature oxidation systems. And it turned out that they were quite successful. So that required me getting back involved. And we evolved a [competitive] system called the Continuous Silox CS2000, primarily for Intel. But Pacific Western was the first company that we really had to stop and say, “We can lose market share.”

Addison: So who was behind Pacific Western?

McNeilly: It was a guy by the name of Dan Worshim. Dan was a character in the business. They had this one design for a system for deposition of low temperature oxides that had better films than we did and a better cost of ownership. None of us liked losing market share. That was the first competition.

Addison: Was there anybody overseas at that time? Or that came much later?

McNeilly: TEL (Tokyo Electron) from the beginning claimed to be a competitor. And [in 1968] I made the decision to go with Kanamatsu-Gosho [as our distributor in Japan] instead of TEL. It was fairly clear to me even back in the ‘60s that they [TEL] would be a competitor of Applied. It was inevitable. And they became a competitor. But during my tenure even in Japan, there really wasn't any competition for the product lines that we were marketing. We dominated 80 percent, 90 percent of the market for the first 10 years.

Addison: What about in Japan?

McNeilly: That was in Japan. In Japan, NEC, Sony at the time were big players in the device market. Or they intended to be. All of those companies had the same philosophy or culture that a Motorola or TI did from the standpoint that they considered the film deposition to be highly proprietary and they made a lot of stuff inside. But once we came along after '72 with the new products, the infrared products, during that period we dominated the market.

Addison: Did you actually become involved in going to Japan?

McNeilly: I set up Japan. Yes.

Addison: So you went there and you chose Kanamatsu as your distributor?

McNeilly: Yes. And Kanamatsu was our distributor until about…my last year at Applied was '79. So in '79 we decided to go direct in Japan . And by '81, Bob Graham was a big part of that and Jim [Morgan] of course. So we established Applied Japan was established, I believe, in 1980.

Addison: So you had left by then?

McNeilly: I left that same year.

Addison: Can you just talk a little bit about going over to Japan? Did you talk to customers there? Any funny stories from your trip over there?

McNeilly: Lots of funny stories. I think my first visit to Japan was in the fall of '68. Well, in late '68 we'd had a number of inquiries from potential reps in Japan . I just recall at that time there weren't many orders [from Japan] and we were trying to expand the business. Japan was a fertile market. There was a lot of interest over there. So I went to Japan in '68 by myself and interviewed Kanamatsu Gosho, Tokyo Electron Labs and a third potential representative. It was really funny because when I went at that time I had a mustache and I wore cowboy boots every once in a while and they were very comfortable. Before I went to Japan , I was all excited about going, as usual, and I asked my daughter to put my dress shoes in my suitcase and she forgot. So I spent two weeks in Japan , at 6 feet 4 inches, on 2-inch cowboy boots and a mustache. It was a great trip and visited all the Japanese semiconductor companies with Kanamatsu and/or TEL and decided on Kanamatsu Gosho [as our Japanese representative].

Addison: When you said you visited the major companies, you mean the device companies?

McNeilly: Yes. We went to Sharp, Sony, NEC; Sumitomo was very large in silicon at the time. All of the majors. And Japan was very rural at the time. Most of these companies were located in rural areas. And almost no one spoke English.

Addison: So had any of the device guys [in Japan] heard of Applied Materials?

McNeilly: No, they hadn't. It was really interesting because the thing that really captured them was…we had made this innovation in an old reactor design, basically a spinning pancake. And we had this one innovation where we actually rotated the wafers using a magnetic coupling so you could seal the chamber so you could do depositions at reduced pressure. And you could get very, very high purity films [using silane]. And they could never figure out how we did it until after they purchased a system. We were smart enough at the time not to tell them. So that innovation alone helped capture the Japanese market for AMAT. Just that little innovation and the performance of the system, which was now running in the AMAT facility, along with the credentials of employees like Walt Benzing and Herb Henderson, gave us almost instant credibility. I think Kanamatsu was very eager with the potential for a new opportunity for them to exploit. So they did a very, very good job for us for more than 10 years.

Addison: So there were no Japanese competitors?

McNeilly: No.

Addison: Were the device makers doing any of this in-house?

McNeilly: Everything was done in-house. At NEC they had the NEC Labs [which] at the time would build the production equipment for the deposition of the films at NEC production. Assembly and test equipment they were buying on the outside as early as 1971.

Addison: So was Japan a big boost for Applied at the time? Did the sales go straight to the bottom line, or was it a drag on the business?

McNeilly: No. We were smart enough to mark up the price and we did everything by letter of credit so there were no cash issues. It was very good business. It was almost counter cyclical. It just seemed like by the time things would fall off [in the U.S.] every two years, the orders would move through the process in Japan . So it became very, very good business for us – very good incremental business. And it gave us the global stature. The same thing for AMAT Europe.

Addison: Did you go back to Japan many times over that 10 year period?

McNeilly: Yes. Many, many times. But Walt Benzing really became the ambassador to Japan for us. Walt was very good, probably more patient than any of us and very good at communicating with the Japanese. He did just a great job. He took a lot of that burden off me. And then I went to Europe and started opening up the European market.

Addison: This might be a sensitive question, but what about Jim Morgan's book, “Cracking the Japanese Market”? It sounds like you had cracked it before.

McNeilly: Yes. Absolutely. Long before the book was written. And long before Jim came on board.

Addison: What about Europe , what did you do there?

McNeilly: Europe was very active. As a matter of fact the European business and Japanese businesses grew very quickly to about equal size and combined, represented more than 30 percent of [our] revenues. I'm talking maybe $5 to $50 million a year for each segment by the mid ‘70s. Europe was a very independent market. All of the nations were always competing against one another. So it was a very good market for us because the French wanted to do their own thing. The British. The Germans. The Italians. Even the Scotts. I opened the office in Munich [in 1971]…that was [AMAT's] central European office for about 10 years.

Addison: A direct office?

McNeilly: Yes. Direct. We had a rep. I hired ASM in 1969 and then terminated the relationship in 1971.

Addison: Looking back on your career, whether it's with Applied or since then, what do you think is your biggest achievement or biggest success or something that really you're proud of. And alternatively your biggest disappointment?

McNeilly: My greatest [business] accomplishment obviously was forming Applied and pulling the team, directors and funding together. Then managing the company through the first 10 extremely difficult years. And [then] bringing in a great management team that was responsible for taking it from where I left it to where it is today, in large part. And initially perceiving the market when no one else did. Other than my children and my grandchildren, that is by far my greatest accomplishment. My biggest mistake was investing in land and real estate. Doing something I didn't know enough about. The mistakes in the [semiconductor] business…while we [Applied] tried to become a full-service company, I think that was probably a mistake at the time. But who knows? Mistakes are always in retrospect. But Applied is a great story.

Addison: In the early days, did you ever have any indication that Applied would go on to be a really big company?

McNeilly: Oh yes. Absolutely. In 1971 when Bob [Graham] and I started pulling together the white paper definition of the wafer fab equipment market, by '73 or '74, that document had grown to eight or nine pages. I wish I had a copy of it. We were predicting substrates as large as, I think, eight inches in diameter. At the time they were three inches in diameter. And then this is what Bob really brought to the table at Applied…we could look at device projections and back calculate into number of systems, number of wafers, etc., required. So we built a real database on understanding the market. Certainly we were up running at a rate of almost $100 million a year [in sales]. So I think our projections were that we could possibly be a half a billion dollar a year company, 10 years out, by 1985.

Addison: So there was the feeling that you were in a company that was going to grow and become a big, long term player?

McNeilly: Never one iota of doubt that if we could dominate the landscape that we would be a major company forever until we got either too big that we couldn't compete and others would come in, or that the industry would become so structured that Applied would be a member of the oligopoly that essentially provided the industry and maintained the status quo, which it has. Never any belief…that there wasn't a great market there and that we'd continue to be technology driven.

Addison: For the last 10 minutes or so let's talk about post-Applied. You're obviously doing Twin Star now, but what you've done since Applied that relates to the industry.

McNeilly: Sure. Well I have started a number of companies. One that was most notable was a company called, Advantage Production Technology. I'd met Bob Dole… Pete Dominici, the Senior Senator from New Mexico , at a conference in Washington DC in 1986. And they were talking about how they could take National Lab Technology and commercialize it. So that intrigued me and I became involved with Bob Dole and Pete Dominici, who were drafting the legislation for Congress to approve the release, under certain conditions, National Lab Technology. So I moved to New Mexico and started Advantage Production Technology. At the time tungsten interconnects were the technology [of the day]. And the National Labs had some very unique technology for radiation hardened devices. And so we started a company called Advantage Production Technology, where I had invented a vapor phase clean that worked hand-in-glove with their deposition technology. So we started the company with great fanfare. And I got it financed…the investors put in about half the cash and we were about to close [when] the stock market crash of October 18, 1987 hit. And the investors went under and the whole project…pretty much came to a grinding halt in New Mexico. Then I restarted here in the Bay Area. Some investors bought the technology from the other investors. So we had about a six year run at that in which we developed what I think was some brilliant technology. SEMATECH and SEMATECH member companies bought four prototype systems. The idea was to demonstrate that we could displace all the wet chemistries, except rinse, with vapor phase analogs. And we did that – demonstrated them very successfully. Unfortunately '91 came along, the recession. I was not running the company [but] we made a couple of bad decisions on the building. And the investors had a dispute and we sold the company to Genus. But the technology was very good and we had a great deal of support from SEMATECH and Intel and Motorola and TI.

And there are a number of other inventions… that I've sold to other companies. Some of them didn't come to market. I can name three products that should be in the market that companies in the industry bought and essentially put on the shelf for whatever reason. And now I'm involved in a company called Twin Star Systems that I think is going to revolutionize some of the inspection business on process tools. It's a real time technology…the first one that I've been really as excited about as I was about Applied. It's that revolutionary. So that brings us up to today.

END OF INTERVIEW

