Oral History of Rick Heim

Interviewed by:
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Craig Addison: Could you start by talking about your very first job in the semiconductor industry?

Rick Heim: My first job was with Bendix Corporation in Holmdel, New Jersey. That was back in 1962 and I actually moved transistors from the plating room to the testing area and I did that for a couple of months…it was kind of funny. I remember the director of HR saying I was maybe a bit arrogant because I went in and told him that the job was an insult to my intelligence and he said, "What do you mean?" And I said, "This is silly. All I am doing is moving plated material back and forth between two places." I said, "I'm smarter than that." And he said, "What do you want to do?" And I said, "I want to be an engineer. I want to work in engineering." He said, "You have to take a test." I said, "Give me the test." And they did and I passed.

They moved me into engineering. I'd been there about a week, I think, and they had a layoff. They laid me off and said, "You can bounce back into the union. That's why we chose you instead of one of our other engineers because it keeps you here in the company." I said, "No, I'll take the layoff. I worked really, really hard to move into engineering. I'll just take the layoff." And the rest was history. They called me back two weeks later and I worked for them for three years. RCA Labs had a technician opening that my boss told me about. My boss used to be my neighbor. I went to RCA Labs in 1965 and worked there until 1969 when, having worked with Kasper Instruments for about a year purchasing some equipment from them, Kasper decided, I guess, I was too much of an annoyance as a customer so they decided to hire me.

Addison: Before we move on to Kasper I want to fill in some of the gaps. Bendix is not a name that you normally associate with transistors. Did they go out of the business pretty quickly?

Heim: Yeah, probably pretty quick. Bendix Semiconductor sold their semiconductor division to Soletron because Bendix said the integrated circuit would never work and Soletron proved it. They went out of business too. Bendix Semiconductor probably went out of business in the early '70s.

Addison: So that was really your steppingstone into engineering; is that what you gained from your time at Bendix?

Heim: What I gained from my time at Bendix was just the basic knowledge of semiconductors. I worked in engineering doing aluminum evaporations and it was very interesting work. It was kind of like the leading edge in a way of that technology because we were also making gallium arsenide devices in those days so it was the early, early days of silicon, photo resist, lithography and aluminum evaporation. I was just kind of researching the aluminum stuff and this opening at RCA came up and it looked like a real deal. I was taking chemistry… going to college at nights at Rutgers University so it kind of fit with that. It turned out to be a great job. I worked for a great guy there [Werner Kern] and stayed there for five years.

Addison: At RCA Labs, what specifically were you involved with?

Heim: I was a research technician and I started out doing chemical vapor deposition researching silane-based depositions from the gas phase down to the solid phase, making SIO_2 basically from a gas. We also did boron and phosphene doped depositions. I worked for Werner Kern. He is very well known in the

industry, specifically in the CVD deposition area and if my memory serves me correctly he received the SEMI award some years ago.

Then I got involved in photo resist and was given an assignment to put together a new photo resist lab, did some research on new equipment. In those days everything was done manually. There was essentially no automation. I remember going to RCA Mountaintop to look at the way their photolith process worked. The operators looked through a magnifier, one of these fluorescent halos with the magnifying glass on it, and they'd have finger cots on their fingers. Vaseline was placed on the backside of a mask and they would manipulate the wafers with their finger to align them to the mask. Then they'd put them in a vacuum exposure system which clamped the mask and wafer together and exposed them. Keep in mind these were power devices so geometries were large and alignment was not super critical. At RCA labs we thought, well, if we are going to build a new lab, we probably should look at what's available for the next generation, moving into some sort of automated handling. So that's what I went out looking for. If we did research with a given tool, we could then move it to the production area.

Addison: Just going back to the CVD, was that equipment all made in-house?

Heim: Oh yeah, we made everything in-house…you wouldn't believe. We had gas bottles, stainless steel tubing, hot plates, small bell jars and gear driven turn tables where three wafers rotated individually. It was really interesting. I learned how to do all the stainless steel plumbing, flow meters etc. We would route the tubing and include the flow meters so we would know the rate and ratios of gases. Wafers at that time were about an inch in diameter. The gases came in from the top into a little quartz bell jar/gear assembly that was sitting on the top of a ceramic hot plate and all of a sudden you had SIO_2. Silicon dioxide on a wafer.

Addison: At that time could you have bought any of that equipment?

Heim: No, no. It was the infancy of vapor phase deposition.

Addison: With the photo resist lab, again, was all that equipment made in-house by RCA?

Heim: No, for the photo resist lab we bought equipment. As I recall we bought a Headway spinner, we had a Platt General alignment tool, we probably had a Zeiss microscope over the alignment tool. There was just nothing automated. Everything was manual, but we didn't make that equipment. The real in-house manufactured equipment in those days was made by the Fairchilds and the TIs that were just getting into mass production of semiconductors and they couldn't buy it any place so they built it.

Addison: At RCA Labs, what products were being made?

Heim: We didn't make any products at the Labs. We were purely research but we would work with RCA Sommerville who had a small bipolar line and RCA Mountaintop who had what we called a mesa line or a power transistor line. It wasn't high volume in those days at all.

Addison: Were there any inklings of the integrated circuit research at RCA?

Heim: Not that I recall, no. But we had lots of labs around RCA. I think we had five buildings in Princeton. I'd maybe work a little bit in conjunction with a lab in building one but I was in building three… it was a big place.

Addison: Any challenges or setbacks that come to mind during your time at RCA?

Heim: There was always the danger, in a way, of working with toxic gases. We had to be very, very careful. Everything was done in a fume hood. We had to go for x-rays every six months to make sure we didn't get silicon in our lungs [silicosis]. There was a risk factor. Running hydrogen through a furnace wasn't the safest thing in the world to do but I don't recall any setbacks. Everything was an interesting challenge since we were basically on the cutting edge of making devices.

Addison: So there were no accidents.

Heim: I recall one but it was minor. A nitrogen bottle…in one of the labs, I don't recall how it fell, but a nitrogen bottle fell over. The neck broke off and that thing took a ride down the hallway like a torpedo and went through a couple of walls, but that's the only thing I recall. We changed our safety procedures after that.

Addison: Can you talk a little bit about the photo resist. Kodak was the major supplier of that, correct?

Heim: Kodak was the major supplier, yes. Headway was the leading spinner manufacturer probably in those days but it was a single spindle, you manually loaded a wafer on to the spindle, you injected photo resist on to the wafer from a syringe, you tried to get the same amount every time and then hit the button to start it. It was really archaic when you think about what was developed over the next ten years.

Addison: Did you absorb much technology from outside? Being on the East Coast people have told me that that was a little bit of a disadvantage in later years because a lot of things happened in Silicon Valley.

Heim: It probably was because so much of the research and transferring of research to manufacturing happened on the West Coast. [But] I don't think it was like a silo. We always went to the American Chemical Society meetings. As a matter of fact, I remember Werner gave a couple of papers on CVD deposition at ACS and Werner and I co-authored a couple of papers. We kept abreast of what was going on in the industry. It wasn't a silo at all. It was too exciting and too new to lock yourself in a room and forget about everybody else.

Addison: Was there any interaction with Bell Labs or any technology licensing that was going on?

Heim: Not that I can recall. My interaction with Bell Labs would have been in later years with Kasper but not necessarily with RCA. As a technician, you are kind of restricted to what you do in your lab and maybe one other lab.

Addison: Maybe we can move on now to how you became involved with Kasper Instruments.

Heim: Well, we were building this new photo resist lab and part of the job for this new lab was to assist the facility in Mountaintop to achieve greater efficiency. We were dealing with one inch wafers in those days. Everything was done with tweezers and by hand so we had a couple of options. We were using a Platt General at the labs and we had two options for a more modern production worthy piece of equipment. Probably the most popular option in those days was K&S. Kulicke & Soffa actually used to be in the aligner business. A lot of people probably don't realize that today but they did. And the other company was this new upstart that everybody was hearing about but nobody knew anything about and that was Kasper Instruments. So I went up to the IEEE show at the [New York] Coliseum in 1968 looking around for an aligner manufacturer that we could use that was somewhat geared towards manufacturing and not just R&D. Platt General didn't have anything, although they were there. They really were still in the R&D mode. K&S had an interesting tool but it was still pretty much manual loading of wafers into the workstation but it did have a split field microscope [which] became extremely important in future years for making alignments. This company, Kasper Instruments, we heard was at the show but I couldn't find them. They weren't in the [exhibitor] book. It turned out they were a late entry for the event.

I was going down the escalator from the third floor and I looked up to the top of the escalator and there was a sign that said "Kasper Instruments – Booth four hundred and something or other – fourth floor." So I went back upstairs and found their booth and they had exactly what we were looking for minus a couple of features which we talked about and they developed while we were going through the negotiation phases of whether we could really use this tool or not. We purchased one and when it was delivered I couldn't get a hold of a service engineer. They were evidently pretty busy, so I got frustrated and installed it myself. I had a couple of questions, so I called the factory, got very familiar with the unit, took it apart a couple of times because things didn't quite come out right after shipping. I just had this great relationship working with them and would ask them if they could do these kinds of things because we were looking towards going to a more automated line, mass production. Finally one day Carl Story said, "I'm coming out to see you. You are a pain in the-you-know-what as a customer. I want to hire you." And that was the beginning of a ten-year experience with Kasper.

Addison: Talking about the market for aligners…Platt General, I haven't heard of that company. What did they do?

Heim: I don't even know. I think they were just a small company. I don't know if they had a parent company or not but they made just a little station with a vacuum hold down on it and a couple of thumbscrews that gave you an XY table and you could mount a mask over it and then flip a lever, clamp the wafer tight to the mask, and expose it with a Sylvania Sun Gun. I don't know if you know…a Sylvania sun Gun was an old light unit that we used to use for 8 mm movie cameras years ago and that was how you exposed wafers in those days. No Osram Lamps or anything like that. I guess K&S probably was the first one to use the high intensity ultraviolet 200 watt lamps.

Addison: Did you say K&S was out of the aligner business by the time you were looking for one.

Heim: No, K&S was still in the aligner business. They were in contention. I did consider them. Both companies had split field microscopes. When you looked through a split field microscope in those days you saw two different sites on the mask/wafer. These two sites were spaced about half an inch apart, for one inch wafers. The mask has horizontal and vertical "streets". These streets eventually become the

scribe lines for separating the die. When you looked at these two sites on the mask they were slightly skewed. This can be very tiring if you sit at the alignment tool for a few hours. You are basically looking through two microscopes at the same time with the images coming up to a prism and appearing in the binocular viewer as one image but separated by a vertical line. The vertical line is created by a hair that is mounted over the apex of the prism. If you rotate the mask you could remove the skew in the image and the horizontal street would appear continuous through the field of view. Neither K&S nor Kasper had this rotational capability of the mask at the time. Kasper had many other interesting features and said that they were considering a feature for rotating the mask. We made a deal and shortly after receiving the tool I received a replacement mask holder for the original tool and this one had rotational ability.

Addison: You said Kasper was very busy because you couldn't get the technician support. Were a lot of these being bought at that stage?

Heim: I don't really know what the problem was. I just know I couldn't get a technician to come down and install it and I'm a "let's get it done" kind of guy. I'm still that way and I certainly was that way almost 40 years ago now. Kasper had a very good manual, so I just took the manual and said, "I can install this thing." There was only one thing that didn't work. I called the factory and they told me how to take it apart and I took it apart and put it back together. I found what was wrong on the inside, put it back together again and that's when Carl Story finally said, "We are going to hire that guy." And I remember flying to Chicago to meet the president of the company who flew from San Francisco to interview me and then we both went back home the same night.

Addison: Who was the president?

Heim: That was Bob Johnson.

Addison: George Kasper was the founder, right?

Heim: George was the founder and I was fortunate to meet George. He had started another company. To be honest with you, I don't remember what George was making. It wasn't competitive that I recall but George every now and then would stop by. He was a bright guy, really neat guy, but he brought Bob Johnson in to basically turn the company into more of a sales and marketing type of company and take this new product to market.

Addison: Do you know the origins of the company? Was it formed to serve the semiconductor industry?

Heim: I believe George came out of Fairchild but I'm not 100 percent sure about that. I think that's where he came from and he saw the same need that everybody else saw that we needed a manufacturing tool, not a research tool.

Addison: How long had Kasper been going by the time you joined them?

Heim: Less than two years probably.

Addison: So this aligner was their first product?

Heim: Yes, absolutely it was their first product. Relay logic. This was long before semiconductors ran things for us.

Addison: What did Carl Story do?

Heim: Carl was our vice president of sales and Carl was actually the guy with a couple of others that started III Industries which later spun off into Silicon Valley Group.

Addison: Can you talk about your first few months at Kasper, what you were doing?

Heim: It was quite interesting. When I went to California to get trained on how to really take this thing apart and put it back together again, the first job they put me on was to debug the relay logic on a new machine they were building for Motorola…probably my first three or four weeks of training was to just de-bug and redesign the relay logic controller. It was a special machine they built for Motorola. With the other things I was doing, I eventually learned how to properly service the machines and they sent me back to the East Coast. I was responsible for everything from Canada to Florida to the Mississippi for about the first year and then they started moving me around the country a lot. I would travel all over the U.S. to try to help troubleshoot. I remember going to Japan in 1970. I thought that was really cool.

Addison: You obviously had a very interesting insight into the device companies.

Heim: Very interesting. I'll never forget going to Japan to work on tools and they would actually take the aligner out of the fab area, the clean room area, and put it on a loading dock. They wouldn't let us in the clean rooms…they put it on a loading dock so that I could rebuild the microscope. That's not a very clean environment. Rebuild the microscope, get it done and they'd put it back in the clean room and use it. We were not allowed into the clean rooms for a long time.

Addison: Was that because they didn't want you to see what they were doing?

Heim: I'm sure it was. And that went on for a while but eventually there was this trust built up and we got into lots of the clean rooms and kind of impressed on them how silly it was to take this thing out into the dirtiest environment you could think of, outside on a loading dock, rebuild it and then put it back in a clean room. It didn't make a whole lot of sense. Those were interesting years.

Addison: Did Kasper have a rep in Japan?

Heim: Yes, our rep was Dainippon Screen who, to the best of my knowledge, never went into the aligner business but they were a major player in the track business in later years, not so much in those days when they were our rep but they certainly did develop tracks and became a major player here in the United States.

Addison: Did you go back to Japan often?

Heim: 1970 was my first trip and I spent a lot of time in Japan with Kasper back and forth over the next nine years…did field service for them. They moved me to California in 1974. I ran field service and

applications engineering, and then a couple years after that they moved me into engineering. I ran a couple of engineering groups. Kasper was eventually purchased by Cutler Hammer. Then Cutler Hammer bought what we called III and then subsequently Eaton bought Cutler Hammer which meant they now owned Kasper and III. Just before Eaton came in, Bill Butler became our president…a really, really neat guy. He didn't come out of the semiconductor industry. We were in Boston at SEMICON East and Bill said, "Join me for a drink at the Sheraton." I did and he said, "I want you to move from engineering to marketing," and I said, "You've got to be kidding me. Those are the guys with the black hats. I don't want to do that." "No, no, I really need somebody to move to marketing that understands the engineering side of it, understands the customer, and can interface between the factory and the customer. We need that interface. Not a sales guy but somebody that can talk technically to the customer." So I did it and it was fun. I really enjoyed it a lot.

I was technical director of marketing for a while. And then I remember we were sitting in a staff meeting. We had just developed a new track line which was really the III line, but we had integrated it to aligners so you could actually run from the track to the aligner back to the track again. That was what Kasper/III did under the Cutler Hammer umbrella. We were coming out with this new line that we wanted to release and engineering had made a couple of prototypes. Our next step was to begin manufacturing these units but our manufacturing manager said they wouldn't take the manufacturing responsibility until the bill-of-materials was complete. Being the marketing guy and being the hyper guy that I am, or was, whatever, I got a little excited and I said, "This is ridiculous. We have a market window. That market window is not going to stay open forever. We need to get some of these things through a pilot production line out into the market." I thought it was understandable but unreasonable that manufacturing wouldn't take them because they didn't have a "completed" bill of materials, so I said, "Why not set aside a manufacturing group that does nothing but build a minimal number of these tools and clean up the bill-of-materials while doing so?" And Bill Butler said, "You go do it." So that got me into operations and that's pretty much what I did the rest of my career in the equipment business…the operations side.

Addison: So you survived all those acquisitions.

Heim: I survived most of them. I left in '78 so I'd been there from '69 to '78, so ten years.

Addison: Who owned it at that stage?

Heim: Eaton. By then we had wire bonders, die bonders, ion implant systems wafer inspection stations and aligners. A lot of companies had been acquired and a great deal of engineering was going on, so it got to be a pretty big organization.

Addison: While we are on this topic, I've asked a number of people the same question. Those conglomerates really didn't succeed. Why do you think they didn't succeed?

Heim: I guess you always have to wonder today, with all the knowledge we have on history, why they'd try to put so may unlike products and the manufacturability of them under the same roof. General Signal was somewhat successful for a while but General Signal didn't do it under the same roof. They did it under separate companies. I really don't know why it didn't work in the long run. Maybe the transition to a high pressure development/manufacturing environment was just too much. Any type of development can

be frustrating but in the case of semiconductor equipment manufacturing it was even more so due to the urgent need for equipment. You promise a customer that it's going to ship on May 1st but something went wrong in the manufacturing process and it doesn't ship until June 1st. That's frustrating for the customer. I'm sure it's not any different in many other industries but the constantly changing technology hurdles made it even more so. I think it was also difficult to transition from semiconductor manufacturing to equipment manufacturing, which many tried to do. Why these companies didn't make it I really don't know. Eaton wasn't successful with putting all those guys together. General Signal turned out to be more successful than most with all the conglomerate growing they had done but even they eventually closed their doors.

Addison: What about GCA. They bought a lot of companies.

Heim: GCA just did tracks and steppers as I recall. But they did buy a lot of companies on the outside. GCA bought Tropel but their product was an integral and important part of the basic stepper. There are other people from the industry who could give you a much better analysis on this subject but in my mind there is a lot to be said for "sticking to your knitting". I think there was just too much diversification going on.

Now, there's one company you can't argue about and that's Applied [Materials]. They've been extremely successful at that kind of diversification. They are the 800 pound gorilla today. So a lot of it has to do with the kind of management and business philosophy. I think when Jim Morgan came in, he came in with a completely different idea of how to run a company coming from the banking world, and he did a phenomenal job.

Addison: You made a comment that the semiconductor guys and the equipment guys were different animals. But you made that change and a lot of people do switch from one side to the other. Is adjusting to that transition quite difficult?

Heim: I think any kind of transitional adjustment can be difficult. The transition for me from field service to marketing…that was a difficult transition. I'm not a sales guy. I love going out with the sales guys and talk about the technical aspects of a product, but I hated the idea of going into a lobby where I didn't know anybody, knocking on the door and saying, "Hey, I'm Rick Heim from Kasper Instruments," or whatever, "and I want to sell you a diz-widget." But I loved working as a marketing guy with the sales guys. I never could have transitioned to sales. It just wouldn't have worked for me. So transitions are easy for some people and for others not so easy. We'd get individuals from completely different industries that couldn't transition in and we'd get others that fit like a glove. I remember I hired a young kid from RCA Mountaintop, Pennsylvania. He came on as a service engineer for me at Kasper, ended up later moving to Cobilt. I don't recall if he went directly to Cobilt as sales or went into field service and moved up to sales, but he became one of the most successful sales reps in the semiconductor industry. Completely different transition from working in a factory as a maintenance guy. He made that transition and was darn good at it.

Addison: Talking about Cobilt, they seemed to be a rising star at the time and kind of went away. Any stories about competing with them?

Heim: It was interesting. We both had automatic aligners when I moved from Kasper to Cobilt. Cobilt was owned by ComputerVision. It was the ComputerVision technology that Cobilt was using for the automatic aligner. ComputerVision was suing Kasper for patent infringements. Whether they existed or not, I don't know, but they certainly thought they did. Things got a little nasty because they started going after Kasper customers which was kind of weird. Why tick off your potential customer because they are buying a competitors tool? If you want the customer to buy your tool, I don't think it's so smart to sue them and then expect them to come running to you to fulfill their needs. The automatic aligner in those days worked in some areas, some types of processes. It didn't work with every type of because the contrast was different on the surface from device type to device type and process to process. I think Cobilt did the same thing that Kasper/Eaton did…they tried to do too much. They went from the contact aligner, that they were very successful at, to the projection aligner, to track gear, to probers. Personally I think it was just too much. It's not sticking to your knitting and, once again, it was all integrated in one place, in one company. The prober and track gear technology Cobilt ended up selling to TEL. The projection aligner I guess died a natural death. I think the diversification and not being ready for it or not understanding how to manage all of it is what probably was the downfall of all those companies. I'm sure there are a lot of individuals around today that were more involved in management in those days than I was and they'll have a different scenario, but that's just kind of the way I look at it. It's just trying to do too much at one time.

Addison: So you did actually go to Cobilt after Kasper?

Heim: I left Kasper in '78 and went to Cobilt as vice president of product planning.

Addison: Why did you leave Kasper?

Heim: I think I recognized it was time to make a change. It maybe was getting a little bit too diversified. I felt it was certainly getting too defocused on the aligner side of things. That was the part I really knew well and it seemed like they were defocusing their efforts on aligners and looking at ion implanters. Ion implantation was more exciting than contact aligners. A good friend of mine, Ed Segal, was at Cobilt. We used to work together at Kasper when we were both on the East Coast. We'd chat every now and then and sometimes he'd dig me a little bit and say, "Hey, Rick, it's time for you to come over here." So I did. I went over and interviewed and they hired me. I worked for Roger Emerick there for a couple of years and then he left to pursue other interests. We hired a new general manager in October of 1980 and in November/December we were evaluating all of our product lines and Computervision upper management joined us in these discussions at our facility in Santa Clara. Some product lines were not doing well and I think it was kind of shocking for Computervision to find out that one of the suggestions was that maybe we should drop them. That's when we found out the company was for sale. It was around May when the sale was finalized and Applied Materials was our new owner. It was difficult talking to Applied about our product lines during the due diligence period. The end result was the new GM and myself were asked to leave. A year or so later at SEMICON West I ran into the individual who had to give me the layoff news that previous year. We had a nice chat and he said to me, "Rick, you got the good deal." I guess that's one of those equipment acquisitions that didn't work for Applied.

Addison: In that short time at Cobilt, what did you learn?

Heim: Oh, boy. It just reinforced what I was pretty sure I knew, that in those days, with the way things were structured, diversification wasn't always the smartest thing to do. Building a tool or telling the customer you are going to build a tool just because your competitor builds one may not be the best way to run your business. Matter of fact, I wasn't with the company three months when I was asked to go to Japan and tell our customer in Japan, who Cobilt had sold a tool to… that we couldn't make it but we would buy our competitor's tool for them and that was a hell of a long meeting. I will never forget that meeting. Two and a half hours. I think that's a lot of what hurt the equipment industry in those days is just trying to do too much with maybe too little knowledge or resources.

Addison: Of course, everybody says that the reason Japanese device makers didn't want to buy from the U.S. was for that very reason, that they may get let down in the end.

Heim: Yeah, and I really feel that in the early days of selling to the Japanese, we didn't support them very well and we basically created our own competitor over there. If they couldn't get the support from the U.S., their only solution was to build it.

Addison: So your take on that whole thing is that the U.S. lost the opportunity.

Heim: I think so, yeah. If you look at all the semiconductor manufacturing tools that are produced in Japan the Japanese now pretty much command those businesses. Projection equipment is a good example. GCA was first but I'm assuming Nikon and Canon are now the primary players. I don't really know where ASML sits any more [because] I've been out of the industry too long. The U.S. for whatever reason lost many of these businesses. Whether it was for lack of support or technology transfer we are no longer the big dog in the pack. This is of course not true for Applied Materials. It's my personal feeling that we created a great deal of this by not supporting the Japanese in the very beginning. We left them no choice but to develop their own.

Addison: How did you see the different attitudes between the two sides, U.S. and Japan?

Heim: Boy, I kind of hate to say it this way…but I think our biggest problem is that we will do anything for a buck and we sold it all to them. We sold everything we had to the Japanese it seems to me. We shipped our highest technology tools to Japan. What did they do? They copied them. Now, did they violate patents? Who knows? They probably did violate some and some they found ways to get around and improve. I think in those days the Japanese were excellent at not necessarily replicating but doing the same job better. I really think we either gave it to them or sold it to them. And it could happen again. China is a sleeping giant. How will they get the technology? We will sell it to them one way or another they and will compete with us. All for the mighty buck. I guess you can say I am a bit cynical about this but I hate to see so much of what the U.S. has invented over the years being imported to the U.S. rather than exported.

Addison: So what happened after Cobilt when they asked you to leave?

Heim: Well, my wife says I sat by the pool for four months and she was afraid I'd never go back to work. [laughs] But I did some consulting work. I did a little consulting work for Roger Emerick when he'd gone over to OSI and then Gary Hillman looked me up and I did some consulting work for Gary. He asked me

to research a company for him he was looking at buying. I went back to Gary and I said, “Why do you want to do this?” And he said, “I need to get in the aligner business because I make track gear and I want to integrate tracks to aligners.” I said, “Why don’t you develop an integration business then? Why get in the aligner business? Keep your track business in New Jersey. Why don’t we start an integration company? And that company’s responsibility will be to take your tracks and integrate them to anybody else’s aligner for more automated manufacturing.” I remember we sat down, had some discussions on this new product line. The controller they had…there was no way [it] was going to work for the next generation of their equipment. They’d have to go out and buy another controller, one that was more versatile or design and build one. I said to Gary, “You are handcuffed. You can’t do things with your tools because you are at the mercy of a company that makes a controller who’s probably not going to change that controller because it’s universal for him. So you probably need to get into the electronics business to support your base products.” So we actually started a Machine Technology division on the West Coast to develop software and electronic control systems. We did all their software development and we made all of the electronics here in California and shipped it back to New Jersey for integration into the tracks. We also started doing the track to aligner integration. They’d finish the track system in New Jersey and ship it to California and we’d integrate it to an aligner. I worked for Gary for a great ten years.

Addison: So when you started doing consulting for him, he hadn’t started this company?

Heim: He hadn’t started the West Coast operation yet. No. He had a sales operation on the West Coast and he had a small manufacturing operation making mask cleaners.

Addison: What was the name of that company?

Heim: It was Machine Technology. It was still MTI. But when we started the software, electronics and systems integration we called it Machine Technology, Systems Division.

Addison: Could you give a little bit of history of your ten years with Machine Technology? What were the highlights and what you did and what you learned.

Heim: We did a lot. As I recall, I joined MTI in 1981. Our first task was to develop and build the electronics for them. At the same time, on the East Coast we started discussions on building a whole new track and that was what we eventually called the MultiFab. In 1981, when I joined the company, they were around $3, $3.5 million [in sales]. We introduced Multi Fab in early 1984 and in either late 1984 or 1985 we were at $16 million. That Multi Fab line really launched MTI. Gary then started a sputtering operation on the West Coast that operated out of our building. I moved the operation from 12,000 square feet on River Oaks Parkway [San Jose] to 52,000 square feet right off of Highway 237 [in Santa Clara, California]. That new facility was specifically set up to manufacture our ion implanters, electronics and controllers and do systems integration to steppers. We had 15 stations for the implanters. It was an interesting move. Those were the days when you could really strike deals for real estate and I remember getting together with a realtor. We looked around and we found this building that might work. It was a shell, we got all the numbers together and the owners [agreed to] put in all the electrical, and believe me, there was three quarters of a million dollars of electrical in that building because of the ion implant stations. I sent all the information back to our office in New Jersey and our attorney said, “There’s something wrong. Nobody would do a deal like that.” So he flew out to California to see exactly what was going on and he was

shocked to find out that I wasn't kidding him and we actually moved from 12,000 square feet to 52,000 square feet and saved a half a million dollars in rent that year. Those were the crazy real estate years.

Addison: It sounds like you were biting off a lot in this company.

Heim: We did. I don't know if Gary would agree with me today, but unfortunately I think once again this expensive diversification of going into the sputtering business was the downfall of Machine Technology. In my opinion Gary got bad advice from people who said they could put him in the business for a million bucks. Larry Hansen [of Varian] told him, "It will cost you no less than $12 million." Larry was closer to right than wrong. Not sticking to your knitting strikes again. Maybe it's the emotion of trying to do something that's more exciting than what you are already doing.

Addison: So what specifically were you doing with MTI?

Heim: I ran West Coast operations for them.

Addison: Were you still involved in engineering?

Heim: Oh yeah, engineering reported to me. Manufacturing reported to me. Sales and marketing did not report to me. That reported to the East Coast but we had a sales and marketing arm in the new building here in California.

Addison: Did you go and visit customers a lot?

Heim: Oh sure. I went out with sales a lot of times to go to customers. We had customers come to our factory. We gave presentations to customers and often times I was called in to do presentations to customers or they would come to us. We always had kick-back Friday. On all other days of the week I wore a tie, but Friday was casual. Now casual meant I'm dressed in slacks and a shirt, not jeans and a T-shirt, and I came in this particular Friday in dress slacks and a shirt and one of our salesmen went crazy because Intel was coming in for a presentation. Our CFO was visiting and the salesman went running to him and said, "Oh, my God, I can't believe it. Look at Rick. He's not wearing a suit." And Sandy [the CFO] says, "So what? He's still probably better dressed than most of the guys that are coming here for the presentation." [laughs] We had a lot of fun over the years, we really did. It was a great, great experience. Every company I worked with I had a good time and we made progress every place I went. Not that I made the progress but we always made progress. One of the best engineering groups I ever worked with was at MTI. Really fun and smart people to work with.

Addison: What ultimately happened to that company?

Heim: MTI was sold off. And then there was a spin-out of MTI called $S^{3.}$ I don't remember what it stood for but a couple of ex-MTI guys started it. They serviced MTI equipment and sold spare parts. The MTI technology was sold to a different company. Art Zafiropoulo [of Ultratech] could tell you who the company was because Art finally bought the technology from that company. I remember Art called me across the street from SEMI to his office one day and he presented me with plaques he had made for two patents that I had and he said, "Rick, you are like family. I own that technology and I bet you didn't get one of

these when you were at MTI." I'll never forget that. I still get a lump in my throat when I think about it. That was such a generous thing he did and I have those plaques right over my computer station in my home office.

While still at MTI I was asked to come over to another company [called XMR] as a consultant, which Gary gave me permission to do, to help them electronically in developing a machine for a new process. The process was called ablating aluminum. It's really melting aluminum on wafers with a laser. I ended up moving over to that company. We developed a complete new machine and processed a lot of wafers for companies. Bell Labs in Murray Hill [New Jersey] came in and ran some wafers and wrote a paper on the process. After three years or so we found out we were really messing with Mother Nature. It was very interesting but the process was too unpredictable. Eventually I decided to leave XMR and I joined my wife's company (SHO) in the tradeshow business. That was 1990.

Addison: OK, Rick, let's finish up there. We'll do another session in the future on your SEMI years, so thank you.

END OF INTERVIEW

