

TEKWeek

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**Board
building
at F1**
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Electrochem makes stylish exit

By DON LEIGHTON

F1 may be like the new kid in the family, getting most of the attention, but that didn't keep the people in the old Electrochem building (38) from "going out in style," according to Gene Hendrickson (Plant Manager).

While Gene is justifiably proud of F1, he's equally high in his praise of those who stayed behind to phase out operations in 38. And that rear guard included a somewhat unusual mix of people—many who would be out of a job when 38 was shut down, and 100 persons on loan from Display Devices as part of a special program. The loaned group included 20 managers and engineers and 80 operators.

"It gave me, personally, a lot of pleasure to see these people join forces and really work together," Gene noted. "The people who came over from CRT were excellent people and the project was a total success. It freed up the F1 technical and management team so they could concentrate on bringing up the new plant. As a result, we were able to bring F1 fully on line four months ahead of schedule. And it came up almost without a hitch, just incredibly smooth.

"If we had been trying to run two plants, it would have been impossible to do that. I can't be positive enough about it. It was an extremely successful project."

Was there a problem of people slacking off as 38 phased out?

"Overall, plant yields actually went up those last few months of operation," Gene said. "I think the people in 38 made up their minds to go out in style and they really did. As one example, we've had problems for years with one of our more exotic products, getting yields of 10-30 per cent. One of the people who came over from CRT ran the yields up into the high 90's. It shows that a fresh approach from

somebody with good process controls and technical skills can really make a difference. They tried something we thought wouldn't work."

George Kersels (Display Devices Manager) is really high on the results of the project also. While the results are definitely bragging material, his concern now is to let others in the company know that it worked—that it's an approach that could be adapted to other situations.

"It was a tremendous utilization of resources," George emphasized. "It saved the company a lot of money because scrap was reduced. It saved money because we didn't have shortages. And we saved money by being able to bring up F1 faster. A lot of good things happened. We worked together as a team and it could be done again."

"There are always going to be unbalanced workloads around Tek," commented Rick Kahn (Project coordinator). "I think this project proves that we can work across division lines to meet objectives."

The germ for the project came from

Bill Belgard (Organization Development). He got Gene and George together to talk about the idea. "He was in an ideal position because he was working with several different groups," George noted. "He saw the problem and could see the ties between the kinds of work done in the two areas."

The loan program started the first week of August and was completed the last week of February.

George named Rick as project coordinator and gave him free rein to talk to anyone in Display Devices about joining the group. "We sent people who were very quality minded, astute people," Rick explained. "Even though they are different product areas, a lot of the generic skills are the same, such as proper handling, taking care of the product and protecting it from contamination."

"These were not surplus people," George added. "In fact, they included some of the best from each unit. Rick was in charge of the whole program and he had a mandate to seek out the people he needed, but they could choose whether or not to go.

"We made sure the people sent over matched what was needed. We prepared performance plans for them and made sure they got trained as quickly as possible to keep producing the parts that were needed. I thought the results were tremendous. If you tell people what is expected and why you're doing it, they'll do a good job.

"Besides freeing up people to go to F1, the project formed a stable workforce in 38 and made it easier for the remaining people to look for other jobs. As these other folks found jobs, they would leave, which is what we expected them to do."

ON THE COVER: Earnest Mirelez and Lisa Vandehey accept circuit boards into the finishing business element from the screening business element.

New circuit board plant 'the best'



By DON LEIGHTON

*How do I love thee, Ef One,
let me count the ways ...
(with help from E.B. Browning).
Ahead of schedule,
under budget, new equipment.
More automation,
faster turnaround, zero inventory.
Safer environment,
better security, computer assistance.
Higher quality,
lower cost, employee involvement.*

It don't rhyme, but it's sheer poetry to Tek management as well as to the people who work at F1, Tek's new circuit board manufacturing plant in Forest Grove. And it all adds up to making F1 the best circuit board manufacturing facility in the world, says Gene Hendrickson (Plant Manager).

F1 was officially in production January 10, but installation of additional equipment and transfer of people from Building 38 to F1 continued until mid-February. At that time, Gene says, F1 was in full operation with about 400 people.

For Gene, it's hard to pick just one part of the project that stands out from the rest. "It includes so many elements—the initial planning; introducing zero inventory and having it be successful; having the plant come up on time; and the response from people going through the training program here is just phenomenal—it's creating a whole different culture. It all seems part of one package.

"Probably the most satisfying part of the project is to see how the people respond to a high-performance management system. To see people change and begin to participate and gain some self esteem has been a very satisfying experience."

Under the zero inventory plan, vendors maintain an inventory at F1, but Tek isn't billed for the material until it is used.

A major consideration in locating F1 in Forest Grove was accessibility to the Unified Sewerage Agency waste treatment plant nearby for secondary treatment of waste water. Primary treatment is done in F1's own treatment facility which Gene calls "world class."

"It's the best," Gene says. "It's totally automated. We recycle a lot of water within the process systems. Some discharge water is used to irrigate the site and any surplus goes to Unified Sewerage Agency."

For a feeling of what F1 is like, Tekweek interviewed several people who have been involved with the project for varying lengths of time and in different jobs: **Becky Gillmouth** (Project Engineering Team), **Ed Berman** (Board Finishing), **David Crew** (Scheduling), **Judy Shanon** (Production Control), **Pat Simpson** (Plating Process), **Steve Rayner** (Historian preparing document of the entire project), **Art Pugh** (F1 Project Operations Manager), **Dave Lintz** (Corporate Construction, Construction Manager for F1), and **Kenneth Roland** (Mechanical Fabrication).

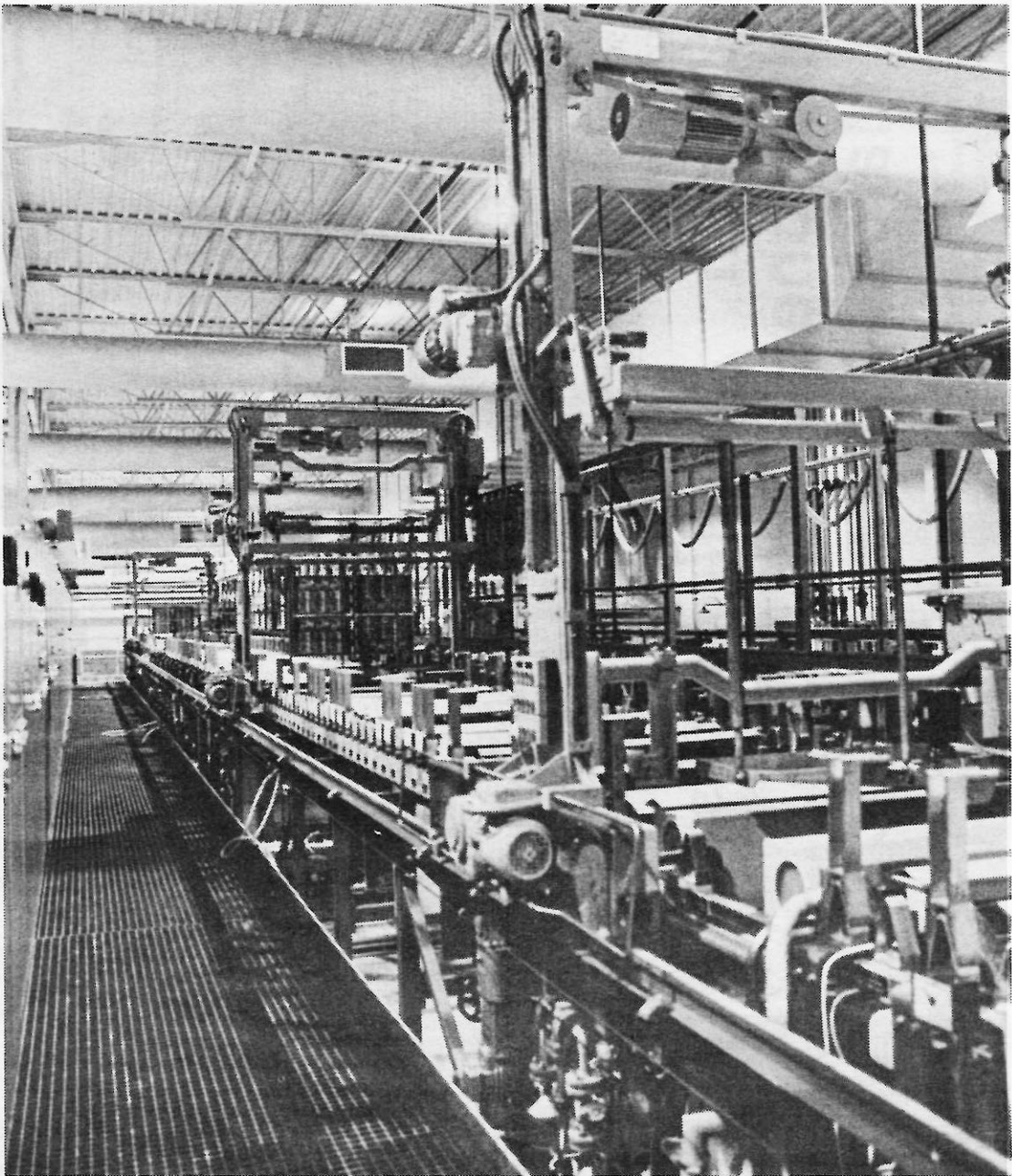
What kind of planning went into this project?

Art: In the preliminary work done to describe the project, there were four major requirements of circuit board production that needed to be addressed:

1. Technology—Our products had moved forward in technology so that our requirement for fine line circuit boards was increasing and our current facility did not have the technology to build that kind of board in volume.

2. Quality—The old plant was pushed so hard that we were having quality problems.

3. Capacity—For the last several years



THIS IS ONE of several plating lines at F1. The computer-controlled carriers move the boards through the various steps in the chemical processing and return the boards to the starting line.



BOB KILLEN tells the computer about a batch of boards that he's starting down the plating line.

the old plant had been running three shifts a day, seven days a week, which left no time for maintenance necessary to keep the facility in tip top shape. We were band-aiding. Any increase in need just could not be met in that plant.

4. Productivity—The old plant was so antiquated there were many operations that were being done just by manual labor—stacking boards, loading and unloading machines, etc. We needed to increase productivity to compete with the outside world.

Once we had those goals identified, we were given the task of implementing the program. It's not only a new building, but almost all the equipment is new, as are the processes.

Dave L.: Corporate Construction became involved in late fall of '80, but we didn't actually take responsibility for the project until board approval in February 1981. In December 1980, we set the goal that we would move in and be in production in January 1983, and that date never moved. The only schedule that would fit with production criteria was building over the winter of '82.

This site had lots of ground water so we did the site work first in order to have a solid base to work on during the winter. We used other techniques to keep the building economical and on schedule, such as tilt up walls and zonolite roof.

A major feature of this project is that the plant is built around the process. I have been involved in several other buildings at Tek, but those were general purpose buildings. Here, we had specific criteria. It was like building a new heart for Tek, because circuit boards seem to be the heart of our products.

We keep comparing the layout to a doughnut because the processes are in the center of the



QUALITY BOARDS still require the human touch, administered here by Karen Glynn (front), Margie Bostrom and Ruth Stagner.

building and the support activities are in the outer area of the building.

When you are building a new plant and installing all new equipment, how do you know it will work when you get through?

Becky: You have to go a little bit on faith, but a rule of thumb that the project engineers seldom violated was what we called proven state of the art—which means in production somewhere in the world for about six months. Everything wasn't quite that well proven, but we had that kind of safety.

Even so, the plating system out there is entirely new. We'd never run it before. And a lot of the equipment was customized to our needs.

Art: Almost all the equipment can be found somewhere, but there is no other place in the world where it's all in one spot like it is here.

Becky: That's right. The screening systems had never been put together before, and the plating system is the biggest of this kind in the world.

Art: In order to make sure we got performance, when we purchased equipment, part of the contract specified that the vendor design, build, ship, receive it themselves here, install, test, and hand us an operating piece of equipment. That was a whole new program for most of the vendors.

How did you go about making the final decision on new equipment?

Becky: In most cases we had at least three vendors to choose from. After gathering data, the team would make a comparative analysis.

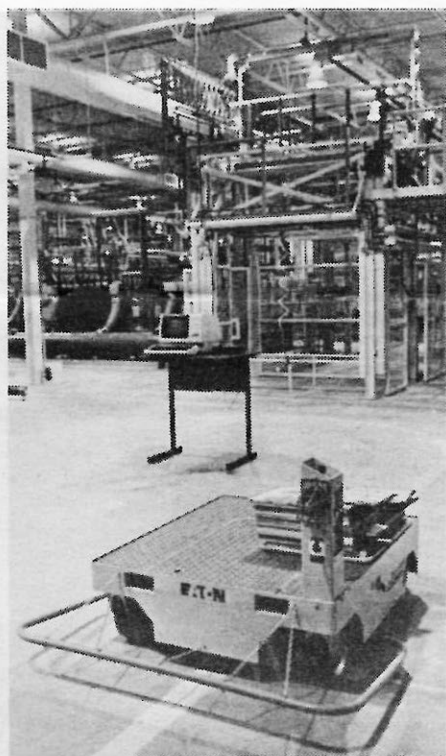
In the original planning, was the process plan laid out before the project was approved?



PERSONS INTERVIEWED for F1 article included, from left: Becky Gilmouth, Ed Berman, David Crew, Judy Shanon, Pat Simpson, Steve Rayner, Art Pugh, and Dave Lintz. Not picture: Kenneth Roland and Gene Hendrickson.



DEBBIE WIRTZ monitors activity on video security system.



UNMANNED DELIVERY CART responds to computer commands and is guided about F1 by an electrical circuit buried in the surface of the concrete floor. Part of the computer-controlled plating equipment is shown at rear of photo.

Becky: There was a plan, but it was more like what we had before in Building 38. When the implementation team came in, we turned the preliminary plans topsy-turvy. We changed the basic concept and went to a lot of newer kinds of things.

What are your impressions of working in F1?

Ed: For one thing, I live in Gaston and it beats the drive to Beaverton. Besides that, my old job was getting somewhat monotonous because there wasn't anything new to learn. Learning the new machinery and processes is a good challenge. It offers something new, which keeps us from getting stagnant.

Pat: When I first heard about the project and the depth of it, I was excited for the whole company. I liked the idea that Tek was finally going to a team concept where the employees would have a say in how things are run.

The plating areas have been in training the longest. We were the first technicians brought out here. At first, we were cleaning equipment and doing a lot of other monotonous work.

When we first got out here, we were introduced to some of the Germans who were putting in the machinery and who we would be working with. That was exciting, too, because they have a whole different outlook on the way to work—and

the way to play.

They made hard work—probably harder than I've ever worked in my life—the most fun I've ever had and the most enjoyable learning experience I've ever had.

In the team concept, if you have a spare minute, you help someone else. It takes awhile for new people here to adjust to that attitude, but they come around. It's great to see people working together. I'm still excited about it.

David C.: Part of our training for F1 was learning the group process. The teamwork concept, like Pat said, is fantastic.

Before, I've had the experience that when I wanted people to listen, it was like hitting my head against a wall. Now people listen. It makes me feel like part of the family out here. It's really super.

Pat: The short lead times are exciting too. If we see something that's late, it upsets us because we want to get things out on time or ahead of time. It's an exciting environment where everybody works together to get things accomplished.

Becky: We had an order for 100 multilayer boards come in that was already late, so we worked from Friday night to Sunday night to get a job done that otherwise would have taken 10 days.

Steve, as the historian for the project, what are some of your impressions of F1?

Steve: The orientation is much different from other plants at Tek in that everything is directed toward production of the product. There are seven business elements, each representing part of a sequence in making a finished product. And each business element looks to the next business element as being its customer.

There's a strong commitment to 100 per cent quality and 100 per cent on time. It's commitment I haven't experienced before.

People are getting better aligned to the group decision process.

There's a strong feeling of commitment toward the goals of F1 by a majority of those here.

What is your communication process?

David C.: We have a core group that includes representatives from each business element.

Pat: We have a core group meeting every morning for day shift and every evening for swing shift. Several people from each business element come together to share information: how orders are progressing, troubles that each element is bumping into and how they're being handled, or whether they need help from others.

Steve: Each of the seven business elements operates as a separate business, on the assumption that small is better. And each element has a variety of com-

mittees or subgroups within it.

Pat: Out of those subgroups, some whole plant committees have been formed to handle plantwide problems, such as safety, janitorial, etc.

Kenneth: Sometimes it seems like there are too many meetings, but the idea is to get everyone involved, to give their opinion. That takes time.

Do you feel safer working here?

Pat: Much. The whole environment of the plating floor is different. There are no fumes. There's a turnover of outside air once a minute. Tanks are built much safer. There's no splashing or fumes coming off. We don't have to handle chemicals directly like we used to, so I don't have to wear my chemical maintenance uniform anymore.

David C.: I like the tight security—the security desks at the building entrances and the cameras scanning the parking lot. I don't have to worry about my car. The cameras scan the parking lot day and night. It's great.

What kind of training program do you have for people coming to F1?

Art: Vendors on this site have check-off lists they go through before something is turned over to us. One of the things on the list is on-site training of operators. This is a different feature for this site.

Pat: Training matrixes provide for cross training of all people within a business element.

Ed: The first part of the training here is an orientation so we'll know what to expect at F1. It gets people thinking along the same track so we can work together to solve problems.

What do the computers do in the plant?

Pat: The computers that operate this plant are amazing. They control the plating process and tell us if anything is wrong. The computers detect problems so early that we can usually correct the problem in time to prevent scrap.

What is the quality of the circuit boards being produced in F1?

Kenneth: There may be some scrap whenever we first change a process or part, but once it's set up, we know we'll have 100 per cent quality.

Becky: To make UL approval by start up January 10, we had to submit the test boards by November 22. There was no time for rework. And they passed.

Pat: The technology is amazing. The product we're seeing come out of here, visually and in all other ways, is so much better than we ever saw come out of 38. The first boards that came through looked better than any we'd ever seen, and it was just a trial run.

Dave L.: It's important to recognize that through the commitment of all the people who've worked on the project that we are meeting the schedule for the building, for the process, and for product out the door. Also, we're doing it within budget, and it looks like performance of the final product will be of desired quality. So the big three—price, performance and schedule—of this project have been met.

What is the current status of the plant?

Gene Hendrickson: We have now moved all the orders that were in process in Buildings 38 and 16 into F1. This transition of bringing up F1, starting January 10, and shutting down 38/16 caused several weeks of poor delivery and created a late order backlog which will take about eight weeks to work down. We now expect to be on schedule by the end of April.

Although output has increased slowly since January 24, it is now exceeding the original shipping plan in square feet of finished product.