

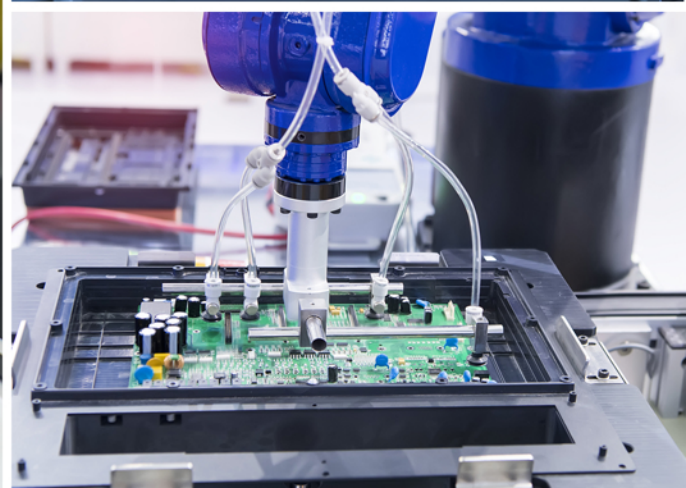
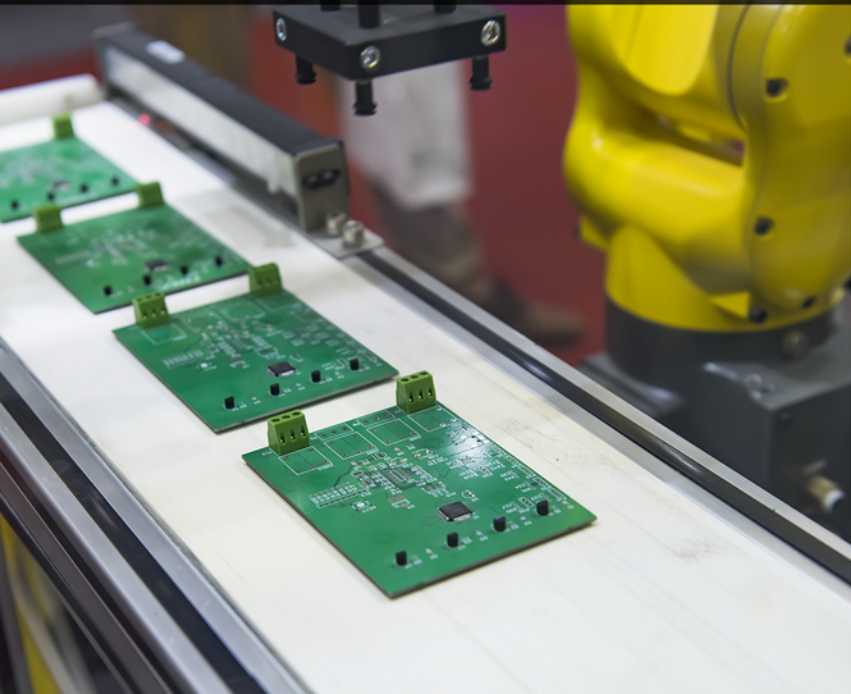
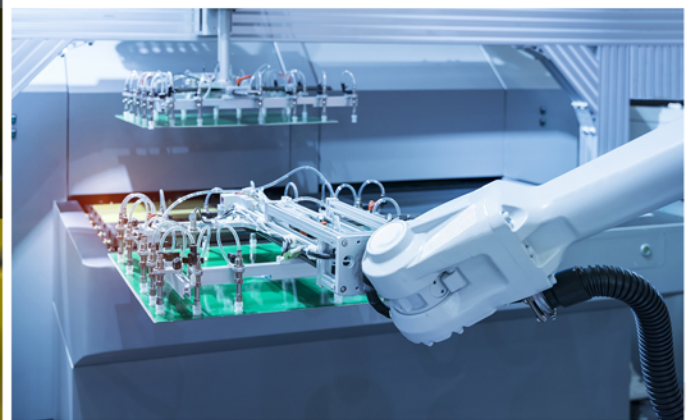
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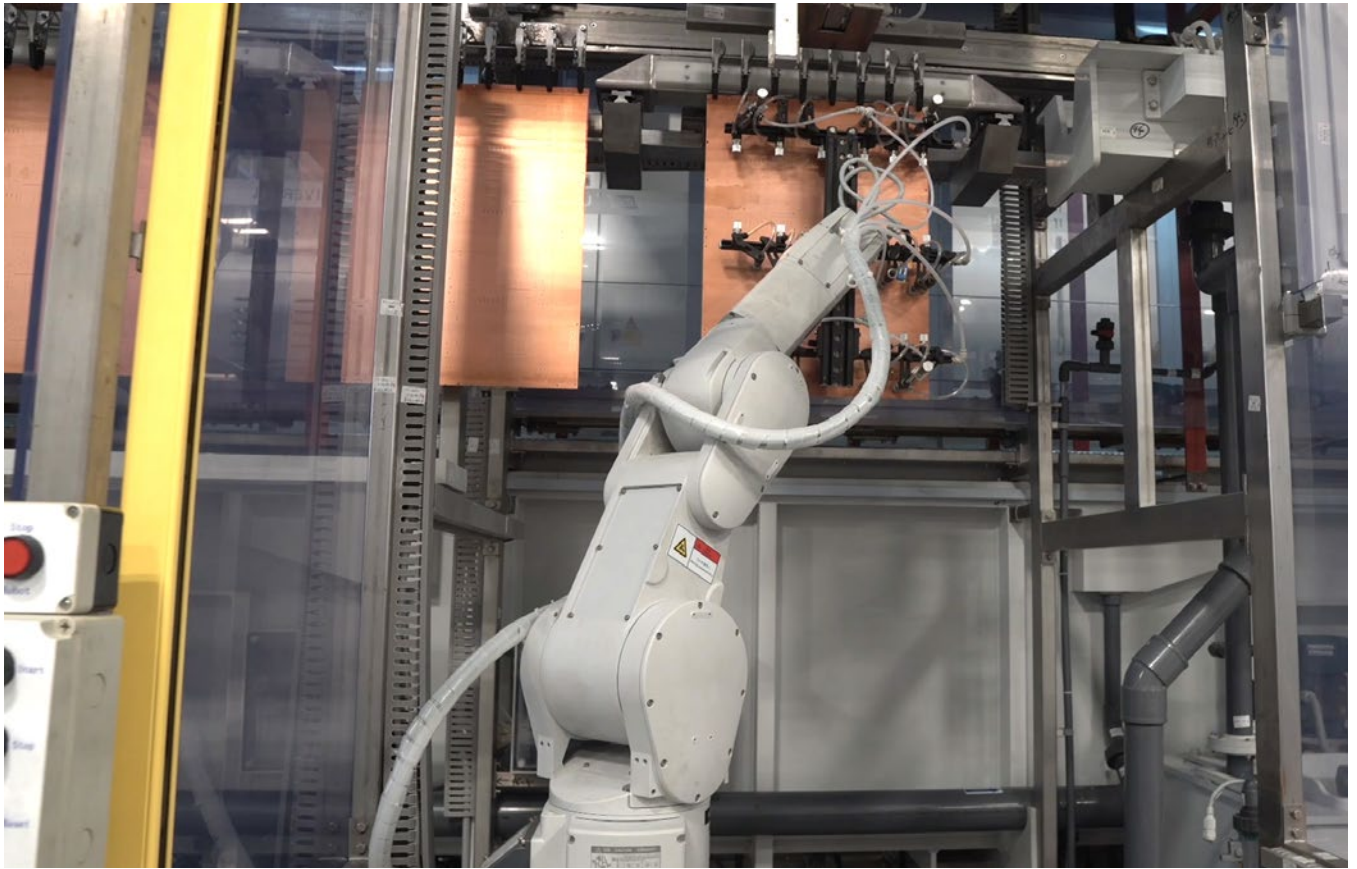
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M A G A Z I N E



SMART FACTORY IMPLEMENTATION PART 2





Automation War Stories From ICM Controls

Feature Interview by the I-Connect007 Editorial Team

Members of the I-Connect007 editorial team met with Andy Kadah, president of ICM Controls, and Kevin Jobsky, senior marketing manager, via teleconference on March 20, 2020. Originally, the purpose of our conversation was to discuss factory automation implementation details. Yet, we conducted the interview in the midst of a rapid-fire and wide-ranging onslaught of executive orders from the federal level on down to the local level meant to curb the spread of the coronavirus.

As we navigated the setup and capture of this interview, New York State-level mandates were being announced, shifting the target for the ICM Controls management team on an hour-by-hour basis. One can sense the can-do attitude and urgency to respond to these shifting requirements in the interview transcript.

Although it was impossible not to intermingle the two topics—automation and responses to the COVID-19 outbreak—as a whole, this discussion sheds light on the qualitative changes that factory automation can bring to one’s business methods. We pick up the interview a few minutes in.

Nolan Johnson: Let me introduce you to Happy Holden, who is one of our consulting technical editors. He is an industry luminary and a pioneer of HDI manufacturing techniques. Happy spearheaded much of the industry, including a lot of techniques related to smart or automated factories. Happy, before this interview started, we talked about roll-your-own equipment.

Andy Kadah: It’s great to meet you. We’re crazy engineers here, who also happen to build what we design. We built all the production bench-

es and a lot of our conveyor systems. We build all of our own test equipment, and we're about to go on a little robotics binge because I have some ideas on how we can build some robotic test benches. You would be amused. This facility is an engineer's toyshop. You can dream something up and have it in your hand in a very short period of time around here. We have the electrical hardware design capabilities and embedded software development, along with product design and the capability of 3D modeling the captive circuit board. We also have the contract manufacturing assembly equipment, in addition to the machine shop for building fixtures automation and benches, molding equipment, surface-mount equipment, and test equipment that's all automated.

Happy Holden: One of the sets of blueprints I have is a build-it-yourself hoist handling system for panels that maintenance men can build out of one-inch tubular steel welded. You put it behind the line and load up your batches and hit the run switch, and it runs along the back, dipping the panels—plus, you can still dip by hand from the front, and it uses electro-mechanical timers.

Kadah: I have the welding facility right here in my tool shop, so if you share it, we'll take a look. As I said, we're crazy; we'll build anything. My dad started the electrical timer industry in 1961 here in Syracuse, New York, with his first company. It was called Syracuse Electronics, and we still make timers today. I can make any kind of timer.

Johnson: Can you walk us through what you have in your products, and what you've been building with your captive facility until now?

Kadah: A lot of our embedded systems controllers contain multiple timers and application-specific logic for the appliance that it is applied to; oftentimes, this means one control board monitors and controls all the appliances that are for heating, ventilating, air conditioning, and/or heat pumps equipment. A compressor will draw a lot of current if you attempt

to start it against high head pressure, so we tend to sell hundreds of thousands—if not millions—of what we call anti-short cycle timers that protect vapor compression systems. We make voltage monitors, so if the voltage is outside of your operating range—like a hot day in New York City—three-phase and single-phase voltage monitors take your equipment offline so that it doesn't burn up the system if bad power is applied. We also manufacture surge suppressors for an additional level of system protection.

We make all kinds of thermostats. We make head pressure controls that vary the speed of a fan for maintaining high head pressure in a vapor compression system under low ambient conditions, where cooling is still required even though it's cold outside. We also make heat pump defrost controls, ignition systems for furnaces—including the controls for residential and commercial boilers—oil burner controls, and pool and spa heater controls. We have 1,600 different part numbers we produce in this facility. The facility is 83,000 square feet. We employ 271 people, and we ship about three million controls a year presently. We hope to expand that number going forward, and we don't want to shrink because of the coronavirus.

Johnson: You recently had a fire in your facility, but there was a silver lining because it allowed you to make some changes to some equipment and to automate.

Kadah: Correct. We had a fire on May 30 of 2017 in our circuit board shop. It was on the preclean line that fed the film laminator. This was about a 60-foot-long piece of equipment in modular form, and it was a plastic fire. There were chemicals in the machine, and it was a disaster. About 7,000 pounds of plastic burned, and when the plastic burned, the soot and the chemical vapor went throughout the facility. It cost us over \$1 million to clean the soot out of the facility.

As a result, we lost a lot of our wet process production equipment, so we bought all new equipment. We make safety controls for fuel-fired equipment; I was not going to produce



The newly upgraded manufacturing floor in the IMS facility.

those safety controls on fire-damaged equipment. We spent about \$7 million in new equipment for our circuit board shop. We ended up selecting UCE out of China because we understood they had the best value. That's how we came to have the first vertical continuous plater in North America installed in our facility. Happy said he knows of or built one earlier!

Johnson: Is that installation working well?

Kadah: It is. I understand UCE sold four or five more lines after we let them do a promotional video, and they brought a couple of their new prospective customers in to look at our shop. We have some robotics in the VCP that load and unload the panels. We have robotics that load and unload the conveyor lines. It's a pretty fancy new shop. It's 18,000 or 19,000 square feet, so it's small, but it has \$7 million worth of new equipment in it.

Johnson: You also do some ongoing process monitoring and adjustment. You're gathering data along the line and doing much of what we've come to expect from a smart factory. Yet, at the same time, you're not using any of the new industry protocols to implement that setup.

Kadah: That's true. We didn't recognize that industry protocol. We just developed our own test equipment because fuel-fired equip-

ment requires some attributes to be recorded on those circuit boards at manufacturing. We laser mark all those circuit boards for traceability, and then we developed the testers for them that record the timing attributes, like how long do you open a gas valve before you sense flame, how many seconds do you inter-purge the burner before you open the gas valve, and how long it takes for you to recognize the flame was lost. Those are all ANSI requirements.

We developed the test equipment in-house and then made it. Right now, I have around 150 of these testers we built ourselves. We used a Dell computer frame with a power supply. We made all the circuit boards that went in it. For the communications with those circuit boards, we interfaced with our mainframe computer and can now record every serialized circuit board, all the critical attributes, and so on.

If there's ever an issue down the road, where that board was involved in a fire or incident, we have documented evidence to prove that it left our factory in perfect condition. That's how we have maintained our competitive edge. Even though labor costs are less outside of the United States, we have been able to survive because we simply outdesign our competitors. We file the IP. Then, we have a competitive edge that has allowed us to survive when everyone else went off to Mexico, China, Vietnam, Korea, and everywhere else, where the labor was cheap.

Johnson: One of the things you shared as we were preparing for this conversation is that there is a company culture of being nimble and responsive, as well as automated.

Kadah: It's the only way we survive, you know. For example, our competitors are Honeywell, Emerson, and United Technologies. They are very big, and we are very small. We have to float like a butterfly and sting like a bee. We must move around quickly, or we'll get squished. We had a competitor who designed a surge protector built in a plastic box. Surge protectors die for a living, and when the competitor's surge protector units started to die, they tended to catch houses on fire because they were plastic.

Even though labor costs are less outside of the United States, we have been able to survive because we simply outdesign our competitors.

We were asked to enter the market about a year before their product recall. When the MOV goes short, it gets very hot and glows red. I put our surge protector in a metal box. I also did something a little different; I found a source of MOVs that had built-in intrinsic fuses. Right around the time we entered the market with our metal box solution and intrinsically fused thermal MOVs, their recall happened, and we had a field day capturing the market share because their recall corresponded with our release.

Kevin Jobsky: The speed in which we got to market with that product was phenomenal. Outside of UL, we had that design in a week or so, with prototypes and everything else. It was fast.

Kadah: We have to be fast and nimble to sur-

vive. It's one of our greatest attributes, in addition to our engineering talent.

Johnson: You mentioned that you have 271 employees on staff. That's a nice size for being nimble, especially with all of the various manufacturing you do. And as we're talking right now, there are a lot of changes going on. We're all in the middle of a bunch of shifts regarding the supply chain and other government-mandated changes intended to respond to the COVID-19 outbreak. How has that affected you in the past few days?

Kadah: We are now rearranging all of our production shifts to maintain compliance with the executive order of Governor Cuomo, which—as of 24 hours ago—was to cut the number of people in your building at any given time in half. As of six hours ago, we got notice that he wants it down to a quarter.

We already have a fairly wide open facility. When we're done rearranging the staff, we're going to have 83,000 square feet, and probably less than 80 people in it at any given time. They said, "Try to maintain a distance of six feet between people." We're going to have 1,000 square feet per person shortly, so we're going to have a very low-density population. This was to responsibly comply with the social distancing requirement and be able to support other essential businesses with the product they need to support the infrastructure during this challenging time.

We'll take every measure that we can, but eventually, they might come back and say, "You have to shut your facility down." Until that point, we're going to comply with every rule they throw at us to keep our facility open. If we go down, then some of our supply chain partners—our customers—go down, and that ripples through this economy. The more companies that go down, the more difficult it will be to recover long-term. We're fighting hard to stay open.

Johnson: You have this ability to adjust your staffing and your operations. It sounds to me like you might be adding additional shifts to

spread out your employees and keep as many of them employed as possible.

Kadah: Absolutely. We're going to four shifts. And people will still get weekends, but their weekend might be a Monday and Tuesday instead of a Saturday and Sunday. I've figured out that with 168 hours in the week, I can run four 40 hour shifts and have the extra eight hours as separation time for when people come and go so that I don't have too many people in the building at any given time, even at shift change. We're going to see how it works.

Johnson: It's interesting that you're able to adjust your resources and spread them out thanks to how your facility is set up and still comply with a government mandate to reduce your staff to 25% of normal while keeping everybody employed.

Kadah: We're very open with our people, telling them, "If we don't supply to our customers, and they don't order anything from us as a result of that, then the next choice is layoffs or furloughs or cutting the staff." When we had the fire, no one could enter the building for 18 days due to the air contamination in the building. I had people working all the way through the Fourth of July holiday, and I was flipping burgers outside, cooking them lunch. We went into 24/7 operations at that point. Our employees were interested in maintaining their jobs. We have a tight enough group where we all pull together. We can roll over and lose our jobs, or we can all pull together and make the exceptional effort we need to make to survive. We did it three years ago, and we're going to have to do it again.

Johnson: What's your take on how much your recent factory automation work enabled this nimbleness for you? You're responding to the market and government orders on staffing, keeping your manufacturing up near capacity for your customers. Do you see opportunities for growth based on the automation?

Kadah: For circuit board rebuilds, we replaced the equipment we had and spent an additional

\$2 million to upgrade what we lost in the fire. We now have additional robot stations that load and unload conveyor systems, including the vertical continuous plating unit that we bought from UCE. The robots came standard on that piece of equipment. We also moved to direct imaging as opposed to film imaging on our circuit boards. We still ended up with a screen printing operation for our solder mask and legend because most of our boards didn't require anything more than that. We were considering going for inkjet printing on the circuit board, but none of the companies could convince us that it was mature enough that we wanted to risk it.

In the wet process equipment, my circuit board manager, Scott Dixon, who has been running that shop for 25 years, realized that he now had the opportunity to do bath monitoring, dosing, and chemistry rebalancing through the control system as opposed to manually checking things with the PLCs built into the equipment. We still manually check the chemistries, but the machines autodose the baths to bring them back into appropriate pH, for instance. And they monitor the turbidity of something and then adjust water accordingly. Our automation will allow for a lower skill level operator, which also enables running multiple shifts.

Here we are now, faced with that challenge. I can't have my top employee work 24 hours a day, so I'm going to have a variety of staffers and rely on the closed-loop feedback systems that we have built into this equipment. I don't think the chemistry is going to get out of whack every 16 hours. There will be a little bit of risk, but we're going to be fine because the frequency at which we have to do a manual intervention right now is weeks—not hours or days.

Johnson: Will this increase your capacity?

Kadah: It will increase the capacity, but not because of the panels per hour. It will be due to the number of hours I can run by allowing us to expand the number of hours per week without having to have the chemist right there babysitting the equipment on the second and third shifts.



The ICM Controls facility in Syracuse, New York.

Johnson: What are you going to do with the extra capacity?

Kadah: The goal is to sell that extra capacity for the support of other essential businesses and, hopefully, capture domestic market share as a result and employ more people here in Upstate New York.

Johnson: In this current environment, you have not only the ability to deliver on all of your in-house manufacturing requirements, but you have the capacity that you can make available to other design teams who may find themselves frozen out from their usual supply chain.

Kadah: That's the whole idea behind pushing this into motion as fast as possible: to help out other companies. Certainly, it will be helping us because we think that the existing business will slow with the economy as a result of the pandemic. However, if we add new things to build and find new customers, we think we can grow through the worst of times. Almost always in a recession, our company grows, and I'm going to give you my take on that.

When everyone's booming, it's difficult to get time out of a purchasing agent or an engineer in a big company. The lines are full, their customer backlog is huge, and they're shipping like crazy. They're complacent and happy. It's during the tough times that those engineers and purchasing agents are being challenged by their managers to reduce cost and or de-

sign something new. That's typically when we grow, in recession, which is counterintuitive. That has been true for the last 35 years.

Johnson: If ever there's a case study for taking difficult and challenging times and working it to advantage, there it is.

Kadah: Again, it's because a lot of big companies tend to be so departmentalized; they have to have a big board of directors meeting, and they'll debate it for three months before they move on something. Around here, we'll debate it for three hours, and then we'll go because we have no choice. Similar to shifting all of these people's work times, I have no choice. Within 35 hours or something like that, I have to be compliant with the law. We have to maneuver, or we all have to go home.

Johnson: Andy, thanks for taking the time, amidst all this chaos, to talk with us. It's like you let us into your war room with you during this interview. We'll let you get back to solving these challenges.

Kadah: Thanks, everyone! SMT007

Editor's note: Shortly after this interview concluded, Governor Andrew Cuomo ordered all non-essential businesses to close throughout the state of New York. However, ICM Controls received authorization as an exempt and essential business; read more on that [here](#). As of this writing, the company is staffed and in production.