

ETHOS AUTOMATION / WHITE PAPER

Nobody Here Has Done This Before

Bringing automation into a plant that has never run it

The first automated cell changes who a plant hires, what maintenance has to know and what the operator's job is. How we take a first-time customer from the site survey to run-off, and what the plant needs in place to own the machine after we leave.

AT A GLANCE

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30 / 75 / 100% Design reviews, with the plant's operators and maintenance in the room

Ontario Safety standard we build to, wherever the machine ends up

Most of the plants that call us have run some automation before. They have a robot cell somewhere on the floor, a maintenance team that knows what a PLC is, and a rough idea of what they are buying.

This paper is for the plants that don't.

Every process in the building is run by people. The maintenance team is excellent at keeping presses, conveyors and hydraulics alive, and has never had to recover a robot. The engineering team, if there is one, has never written a specification for a machine that does not exist yet. And the person who has been asked to look into automation is usually doing it on top of a full-time job.

None of that is a reason not to automate. Some of the most demanding cells we have built went into plants exactly like that. A nuclear component manufacturer standing up a brand new program, whose comparable parts had always been moved by crane with two people on every lift. An aerospace manufacturer whose shot peen line ran on two overhead cranes and whoever was free to walk over. A transformer manufacturer where every lamination in every core had been placed by hand, because nobody had ever managed to automate it.

None of them had run automation on those processes before. Two are running it now, and the third is being installed. What they had in common was not experience. It was a willingness to do the first project differently from the tenth.

The First Machine Is Not Really About the Machine

A plant's first automated cell changes more than the process it replaces.

It changes who the plant needs to hire. It changes what maintenance has to know at two in the morning. It changes the operator's job from doing the work to tending the equipment that does it. And it puts new safety obligations on the employer that did not exist when everything was manual.

The machine is the part everybody pictures. The rest is what decides whether that machine is still running at rate two years later or sitting behind its fence with a sign on it.

The difference between those outcomes almost never comes down to the engineering. It comes down to whether the plant was ready to own what it bought.

Why First Projects Go Wrong

First automation projects rarely fail on design. When they disappoint, it is usually for one of five reasons, and all five are decided before any steel is cut.

- The process was not stable. If the part only comes out right when a particular operator runs it, a machine will make bad parts consistently.
- Nobody wrote down the number. "Faster" is not a specification. Parts per hour, at what quality, across which variants, is.
- Nobody owned it on the customer side. The project was a side task for someone already stretched, so decisions waited and questions went unanswered.
- Acceptance was never defined. What counts as done got negotiated at the end, under schedule pressure, by tired people.
- The machine arrived at a plant with no one who could support it. The first fault that needed more than a reset became a service call, and then a week of downtime.

The way we run a first project is built around closing those five gaps before they open. It runs in eight steps.

Step One: Pick the Right First Project

The first cell sets the plant's opinion of automation for years. It should be chosen with that in mind.

The best first project is not the hardest job in the building, and it is not a trivial one either. It is a process that is already stable, has a clear and measurable payoff, and is visible enough that people on the floor see it working. Often it is the job nobody wants: heavy, repetitive, hard on the body, hard to staff.

For a plant new to automation, this starts with a paid site survey. We walk the floor with the customer and look at the process as it actually runs, not as the routing says it runs. We ask the questions that decide whether it is ready: what is the real cycle time, how much does quality vary between shifts, how many part variants are there, including the one that only runs twice a year. The customer comes away with an honest answer about whether the process is ready and what automating it will take, whether or not they go on to buy a machine from us.

If the process is not ready, we say so. Sometimes the answer is to fix the process first. Sometimes it is a proof of principle, where real parts go through a test setup before anyone commits to a full cell.

The transformer manufacturer is the clearest example. They did not ask for a production line. They asked whether the thing was possible at all. So before quoting a system, we ran a proof of principle that split the problem into three stages and built five prototypes in four months. Two of them failed. Those failures are the reason the production cell works, and they happened on test rigs, not on a machine the customer had already paid for.

Step Two: Write the Number Down

Before design starts, we agree with the customer on what the machine has to do, in numbers.

That means the rate, the quality level, every part variant, and the tolerances, not just the nominal dimensions. Automation has to work on parts at the edges of their tolerance bands. A print describes a part you will rarely receive, so we ask for real parts, including the ones that would normally be rejected.

Getting those parts is harder than it sounds, and a first-time customer should plan for it. On the aerospace cell, every variant had to be proven against real components pulled from a production floor that still had orders to fill. Parts were set aside for our use and tracked on both sides. Getting enough of them, for every variant, was a project inside the project.

It also means writing the acceptance test at the start: which parts, how many, at what rate, measured how and over how long. Written at the start, the acceptance criteria are an engineering target everyone designs toward. Written at the end, they become an argument.

Step Three: Name Your Owner

This is the single biggest predictor of how a first project goes, and it is the one we push hardest on.

The customer needs one person who owns the project on their side. Not a committee, and not someone who will get to it after their real job. One person who attends the design reviews, makes decisions or knows who does, chases internal answers, and is accountable for the plant being ready when the machine arrives.

Plan on about four hours a week from that person through design. It increases as the project moves into build and testing on our floor, and again when the machine arrives on theirs. That time has to be given to them, not found by them.

On a first project the owner learns a great deal, and that is the point. By the end they should understand the cell well enough to own the next one.

Step Four: Design With the People Who Will Run It

We hold design reviews at 30, 75 and 100 percent. They are not presentations. They are where the customer's team gets to change the machine while changing it is still cheap.

For a plant new to automation, we ask for more people in those reviews than a seasoned customer would send. The project owner, naturally. But also an operator who runs the process today and a member of the maintenance team. The operator knows where the parts actually come from and how they actually arrive. The maintenance technician is the one who will have to reach that cylinder, swap that gripper finger and clear that jam. Both will see things an engineer at a desk will not.

The customer's people are not there as an audience. On the transformer job, one of the two part-handling concepts that went to prototype came from the customer's own engineer, and it was the customer who proposed the clamping sequence the final fixture was built around. Two of their engineers stood at a live bender with two of ours, running real laminations through hand-operated prototypes. Nobody understands a manual process better than the people who have been doing it.

This is also where we settle the plant's standards. An experienced customer sends us their PLC platform, safety standard and naming conventions with the RFQ. A first-time customer usually does not have them yet. We will build on whatever the customer wants, but when there is no standard, we recommend a platform based on one question: who can the plant hire locally to support it? In Ontario that usually means Allen-Bradley controls and FANUC robots. In Puebla, Mexico, it usually means Siemens and KUKA. The best platform for a first cell is the one the plant can find technicians for.

Step Five: Train Before It Ships

The Factory Acceptance Test at our facility is the first time the customer sees the machine run on their own parts. For a first-time customer it is also the first training opportunity, and we treat it that way.

The people who will own the machine should be at FAT. That means the owner, the maintenance technician who will support it and at least one lead operator. They see it run, they see it fault, they see how it recovers, and they ask questions while the people who built it are standing next to it. Problems found at FAT are fixed in our shop, with our tools, before they become problems on the customer's floor.

Step Six: Get the Site Ready, Then Make It Safe

A plant that has never installed automation has usually never had to prepare a floor for it.

Power drops, air supply, network, floor anchoring, cable routing and clear access for rigging all have to be in place before the machine arrives, and on a first project the customer often does not know what that list looks like. We give it to them early. On the nuclear cell, we tracked our own installation time and found that what cost the most was not engineering. It was sequencing: power and air arriving later than planned, cable trays being cut on the day, several trades working the same footprint at once. Site readiness is a shared problem, and it is now a standing part of how we plan every installation window.

Safety is the other thing first-time customers underestimate.

We build every machine to the Ontario safety standard, wherever in the world it ends up, because it is usually the more stringent one. In Ontario, Regulation 851 section 7 puts the duty for a Pre-Start Health and Safety Review on the employer operating the equipment, and the review has to be done by a professional engineer. It is not something the integrator signs off on the customer's behalf. We design to make that review straightforward, and we verify our own work against it before the machine leaves our building, but the customer needs a reviewer lined up before install. Plan for it at kickoff, not the week the machine lands.

Safe operation does not end with guarding. The plant needs lockout procedures for the new equipment, and operators and maintenance trained on them, before the cell runs in production.

Step Seven: Run-Off, and What Comes After

On site, the machine is installed, brought back to the condition it was in at FAT, and proven again in the customer's environment against the acceptance test agreed at the start. That is run-off, and it is the point where our on-site commitment ends.

That needs saying plainly to a first-time customer, because a new cell does not reach its best performance on the day it is run off. Operators are still learning a new job. Upstream processes that were fine feeding people sometimes turn out not to be fine feeding a machine. A part that a person would quietly straighten before loading now has to arrive straight. Those issues surface in the weeks after run-off, and they are normal.

Who handles them is the reason the next section of this paper exists. A plant that has its people in place by run-off works through those weeks itself. A plant that does not can buy additional on-site support from us, quoted separately, and plenty do. But it should be a decision made at the start of the project, not a discovery made at the end.

Step Eight: Hand It Over Properly

At handover the customer receives the documentation they need to own the machine: an operations manual, electrical and mechanical drawings, the PLC and robot programs, safety documentation, and a spares list that separates the parts that wear from the long-lead items worth holding before they are needed.

Training is delivered on the customer's machine, with their parts, to their team. It should happen more than once. The people trained on day one are often not the people running the cell in year three.

After handover, support comes from the people who built the machine. Remote first, where that will solve it, on site where it will not. Those people know the cell because they commissioned it, and the drawings, code and project history are in our building.

What You Will Need to Hire

This is the part of the conversation most plants have too late.

An automated cell needs different skills on the floor than the manual process it replaced. Some of them can be developed in the people the plant already has. Some have to be hired. Either way, they need to be in place by run-off, not after the first breakdown.

These are the six roles we recommend a plant plan for, roughly in the order it needs them.

- An automation owner. Usually an existing engineer, supervisor or maintenance lead given real time to run the project. Needed from the site survey onward. On a first project this is a development role as much as a job.
- A controls-capable maintenance technician. Someone who can read an electrical drawing, go online with the PLC, find the input that is not making, and recover the robot after a fault. In Ontario that is typically an industrial electrician (442A) or a millwright (433A) with controls training. If the

plant has one already, they should be at the design reviews. If it needs to hire one, the hire should be made early enough that they attend FAT.

- Shift coverage for that skill. One trained person cannot cover three shifts. At minimum each running shift needs someone who can clear a fault, recover the robot to a home position and restart the cell safely. That person is often a lead operator trained up rather than a new hire.
- Operators trained as tenders. Fewer people than the manual process, but the job is different. They load and unload, monitor quality, respond to alarms and handle the routine recoveries. The best candidates are usually the experienced operators who already know the part.
- Someone who owns safety on the new equipment. Lockout procedures, guarding checks, coordinating the pre-start review. In a smaller plant this is an existing role taking on a new responsibility.
- Over time, a process or manufacturing engineer. Not needed for the first cell to run, but needed for the plant to get better at running it and to lead the second project.

The operator role is the one that changes most visibly. On the nuclear cell, the job is now to load a cart, scan the barcodes and walk away, while eight foot, 400 lb (180 kg) components are turned, machined, measured, marked and stacked without a crane or a second person under the load. That is a better job than the one it replaced. It is also a different one, and the people doing it need to be trained for it.

Hiring for skills the plant has never needed is hard when nobody in the building has done it before. We help with that too. We can write the job descriptions for these roles or review the ones a customer has drafted, and we can help locate candidates. Since the platform was chosen around the local talent pool, the people the plant needs are people who exist in its area.

A plant that cannot hire all of this at once has options. Existing maintenance staff can be trained on the specific cell, additional support from us can cover the gap while the internal team grows, and some skills can be shared across shifts until volume justifies more. What does not work is assuming the machine will not need anyone.

What We Bring, and What You Bring

A first project goes well when both sides know what they are responsible for.

We bring the site survey, any proof of principle, the design, the build, the programming, the Factory Acceptance Test, installation and commissioning through run-off, the documentation, the training, help with hiring, and support afterwards. We bring mechanical, electrical and controls engineering under one roof, so the questions a first-time customer asks get answered by the person who actually did the work.

The customer brings a stable process, the real parts, the number, an owner with time, a site ready for installation, a safety reviewer, and the people who will run and maintain the cell after run-off. That is not a small list, and pretending otherwise does nobody any favours.

The Second Machine Is Easier

The goal of a first project is not only a cell that runs. It is a plant that knows how to buy, run and maintain automation, and a team that is ready for the next one.

The clearest sign that worked is when the customer comes back. The nuclear manufacturer did, a few months after buy-off, with a change to mark the parts on both sides. It was scoped, issued on a new purchase order and signed off within about two months. The aerospace cell was designed from the start with its next step in mind: the cart stations are built for autonomous mobile robots and AGVs, so the one remaining manual task can be automated when the customer is ready, without a redesign.

That is what the second project looks like. The customer arrives with standards, an owner who has done it before, a maintenance team that knows the platform, and a clear idea of what to automate next. Automation stops being a project and becomes part of how the plant runs.

If you are looking at your first automated cell and are not sure where to start, start with a site survey. We will tell you honestly whether the process is ready, what it will take, and what your plant will need to own it after we leave.

About Ethos Automation

Ethos Automation is a Canadian automation integrator based in Brantford, Ontario. We design, build, program and commission robotic and automated systems for manufacturers in automotive, aerospace, nuclear and general industry, from single cells to complete lines.

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