What the Silo Was Hiding

A plastics plant fixed a safety problem and found something bigger: It had been giving away money nobody knew was missing.





In Orlando, Florida, one of the world's largest packaging companies makes containers for everything from shampoo to baby formula. The network watching over its raw material is EtherNet/IP, running on a two-wire standard called Ethernet-APL, and it uncovered a problem this plant didn't know it had...



Plastic resin pellets

First, you see rain on the horizon. Then the wind, coming in hard across the flat Florida landscape. And finally, the climb: 50 rungs, straight up a steel ladder bolted to the outside of a concrete silo.

With the sky darkening, you make your way up, up, up. As you summit the silo, everything gets louder. A metal catwalk spans this silo and five others, each one fifty-five feet tall and housing hundreds of thousands of pounds of tiny plastic resin pellets.

You clip your safety harness to the handrail. You cross to the hatch and heave it open. As the noise and wind lash at you, you peer down into the pure darkness.

You're up here to answer one question that the gauge in the control room can't be trusted to answer accurately: **How full is this silo, *really*?**



It's not an idle question—not for one of the world's largest packaging companies, running more than 400 locations in 40+ countries. Their Orlando facility—with its six 55-foot silos—holds the raw resin pellets that get heated to 600-700 degrees Fahrenheit and extruded into shape.

Trucks deliver the resin. A driver pulls up, hooks a hose to the silo, and a blower pumps pellets in under pressure. They move fast, and they're hard to stop precisely on command.

For years, the gauge that was supposed to tell everyone involved when to stop was the same one nobody trusted. And inaccurate timing could lead to overfilled silos or clogged pipes. That would mean manual cleanups and delays. It happened regularly.

But the problem wasn't just the filling. **EtherNet/IP**—the industrial networking protocol standard that connects controllers, sensors, and machines on a plant floor—already ran throughout the rest of the plant. Just not on these silos. The sensors here used a different, decades-old technology: a two-wire analog signal. They output a weak four- to 20-mA (milliamp) current, which carried almost no usable information back to anyone. This technology couldn't be trusted during filling, when it mattered most. And even at rest, it sent back almost no usable data to the engineers in charge.



Without a reliable way to know what a silo actually held, or how much room was really left in it, mistakes multiplied downstream.

The climb wasn't a one-time inconvenience. It was routine, repeated across six silos, again and again as deliveries came and went. Even on a clear day, it cost real time, done just to answer a question a sensor should have been able to answer on its own, instantly. When a storm rolled through, the climb had to wait altogether—sometimes long enough to push the work into overtime.

Bad readings caused problems beyond the silo roof too.

Without a reliable way to know what a silo actually held, or how much room was really left in it, mistakes multiplied downstream: a truck might deliver the wrong material into the wrong silo, an operator might pull from a silo believing it held something it didn't, or a production line might draw down more material than anyone realized. None of these were caught quickly. When they were caught, the fix wasn't simple. Sometimes a silo had to be drained and started over.

Pat Koenig has had, to put it lightly, a lot of job titles. Electrical engineer by training, Pat spent many years running instrumentation and controls projects for large food manufacturers before joining VEGA in 2006, the global instrumentation company whose sensors measure pressure and material levels in tanks and vessels around the world.

Pat's roles within VEGA have expanded steadily over the last two decades: technical sales specialist, then sales engineer, then product manager. These days, if you ask Pat what he does, his honest answer is something like "all of the above." In short, nobody knows the ins and outs of industrial sensors—and the networks and protocols that carry their data back to a control room—better than Pat.

So, when the packaging company's old sensors became too unreliable to trust, the company called him in.

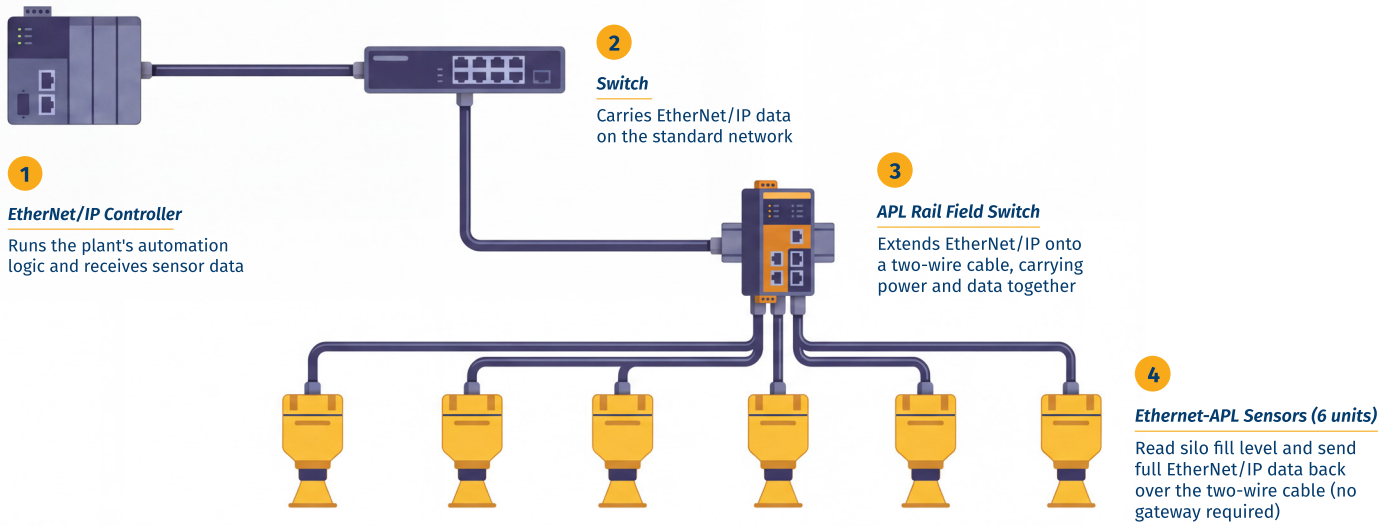
Koenig's solution used a non-contact radar sensor, mounted on top of each silo, reading the resin pile below without ever touching it. What made this solution different wasn't just the radar; it was how—and how much—data the sensor could collect and send back to the controller below.

The old technology sent back a single signal: a tiny current to a Programmable Logic Controller (PLC), where it was translated into a fill percentage. That was the entirety of the data the sensor measured, and it got even that wrong far too often.

Meanwhile, the new sensor, connected through an industrial standard called Ethernet-APL, sends back dozens of readings at once, including:

- fill level
- device temperature
- signal reliability
- operating voltage
- diagnostic health

... and much more—all in real time, all flowing straight to the control room.



One Cable, Two Jobs

A typical Ethernet-APL setup: *one cable carrying both EtherNet/IP data and power to the sensor.*

Ethernet-APL stands for ***Advanced Physical Layer.*** It isn't a new protocol; EtherNet/IP still runs on top of it, doing the same job it always has. What's new is the wiring underneath: a two-wire cable, rated for hazardous environments (like dust or gases), carrying full Ethernet speed over distances old cabling simply can't. And Ethernet-APL does all this work without a separate power line. **One cable, two jobs.**

Pat Koenig has a simple, powerful way of describing the difference Ethernet-APL makes—one he picked up from a video produced by **ODVA**, the independent, not-for-profit organization that maintains the EtherNet/IP standard worldwide.

"Picture the old technology as a two-lane road that narrows down to a one-lane bridge. Only one car can cross at a time. You wait for your turn, cross, and then it's someone else's turn to wait." As Pat points out, it's one direction at a time, no way around it.

"Now we bring in Ethernet-APL with EtherNet/IP on it, and suddenly it's a four-lane highway in each direction," Pat says. "It could be six lanes or eight! Almost anything is possible now." Data now moves both ways at once, as much as the plant needs, with no one waiting their turn.

It mattered that the sensor spoke EtherNet/IP directly. Because the plant's controller shared the exact same protocol, the sensor could plug in and integrate immediately—no translator boxes or extra hardware required.

The whole project cost $90,000. The packaging company got that back in three months in prevented spills and labor no longer spent correcting a number nobody trusted.

But then the technology found something nobody had budgeted for at all.



5,000 lbs. vs. 6,000 lbs.

Reported Resin Usage vs. Actual Resin Usage

"The company had been quietly over-applying material for who knows how long, using more resin than any order called for, and eating the cost of it without ever seeing it on a ledger."

- Pat Koenig, Product Manager, VEGA Americas, Inc.

The new sensors were designed to solve a safety and inventory problem. What they actually did was expose an accounting one.

Once the company could trust its silo data, they started checking those numbers against numbers from elsewhere in the plant. A blending machine downstream—the one melting resin into finished product—reported using 5,000 pounds of material for a run. The silo's own data told a different story: 6,000 pounds had actually left the tank.

This 1,000-pound gap wasn't a rounding error. It was happening run after run, and nobody had known because nobody had ever had two numbers reliable enough to compare. Pat calls it reconciliation, a word that undersells what it uncovered: The company had been quietly over-applying material for who knows how long, using more resin than any order called for, and eating the cost of it without ever seeing it on a ledger.

"The reconciliation is probably one of the big ones that they didn't expect," Pat explains. "You can obviously see the spills and the safety things. The reconciliation, they didn't expect."

It's a strange kind of problem to be pleased to find. Steve Fales, ODVA's director of marketing, has spent years making a related pitch to plant operators considering better connectivity: **More data, delivered faster, will pay for itself.**

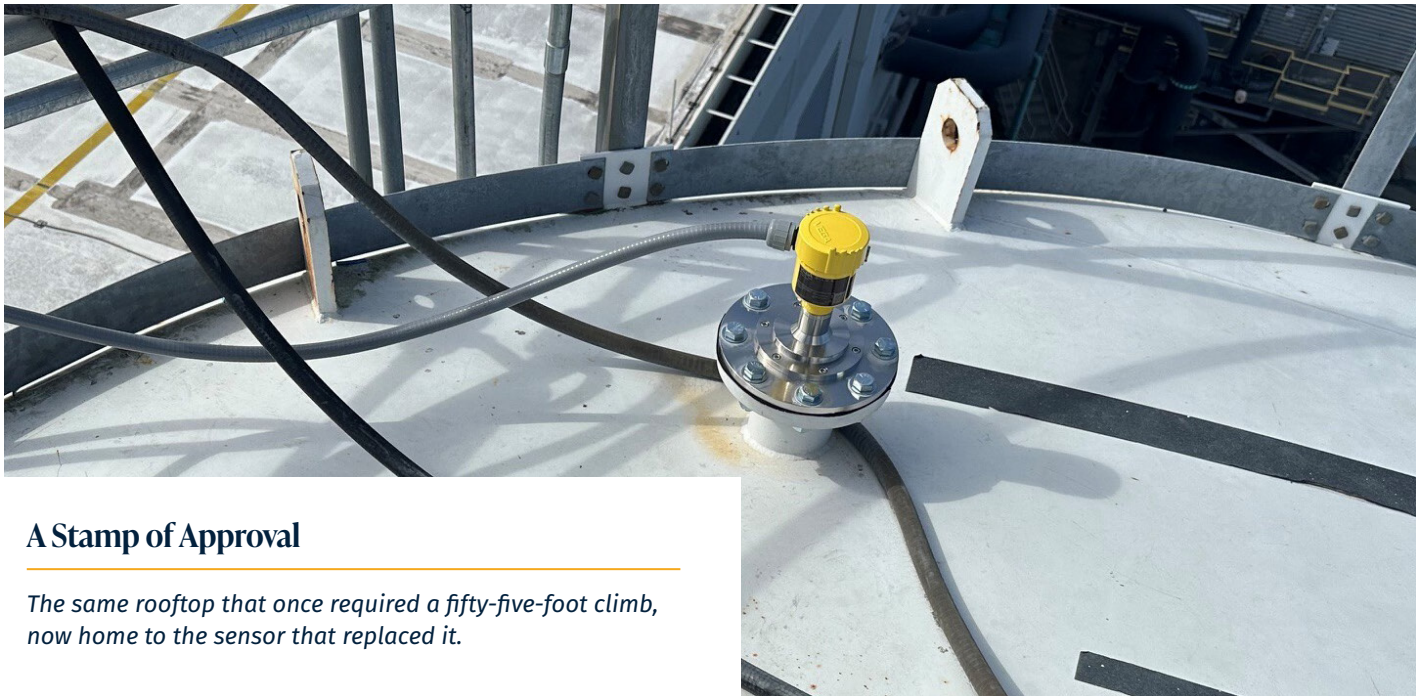


Real-time fill data for all six silos

The hard part has always been proving it before the fact. "We've had this really difficult chicken and egg problem," Fales says, "where we've been trying to tell all these end users, 'You're gonna get all this data, it's gonna be great.' And they're like, 'Well, what am I gonna do with it? How's this gonna prove ROI?'"

At the company, the answer arrived on its own. After all, nobody asked the new sensors to go looking for overproduction. They were installed to stop overfills and end the climbing. The reconciliation was a discovery nobody had budgeted for, made possible only because the data, once trustworthy, could finally talk to itself.

An earlier version of the sensor shipped without EtherNet/IP support, relying on a traditional 4-20 mA output that the plant was accustomed to using. But the facility needed additional data fed directly into its inventory management and analytics programs. The company's contact turned it down flat. "Can't use that," he told Koenig. "It doesn't help me."



A Stamp of Approval

The same rooftop that once required a fifty-five-foot climb, now home to the sensor that replaced it.

When VEGA came back with a version that spoke EtherNet/IP, the answer changed instantly. "As soon as we said we had EtherNet/IP, they're like, thank goodness," Pat says. "My partner at the company said, 'I'm ready, I want to do it, I want to try it.'"

When he's designing solutions for his clients, Pat doesn't talk about ODVA conformance testing, not by name. Nobody asks him to explain the process behind the EtherNet/IP mark. But the mark itself—the EtherNet/IP stamp on a device—does real work before a single wire gets run.

"If we didn't have EtherNet/IP, would this sale have gone? Probably not," Koenig says. "It's a stamp of approval. You feel safe buying it."

That confidence isn't sentiment. It's the product of a system working exactly as intended: independent testing, administered by ODVA, confirming that a device does what it claims before it ever reaches a customer. A plant engineer deciding what to bolt onto a fifty-five-foot silo doesn't need to know how that testing works. He only needs to trust that it happened, and that ODVA stands behind it.

The company already has eight more applications lined up internally, other places across the plant where the old sensor technology is still running, waiting for the same upgrade.

For Pat Koenig, the significance runs a little deeper than the next sale.

"We wanted to get another EtherNet/IP story under us," he says. "We call six silos a good start on a brownfield."

"Brownfield," in industry terms, means retrofitting a plant that's already running, not building one from scratch around new technology. It's the harder case to make, and the company's silos just made it.

At the Orlando plant, six concrete silos still stand fifty-five feet tall, connected by the same metal catwalk, the same ladders still bolted to their sides.

The hatches on top still open, if anyone needs them to. Nobody does. The number that used to require a climb, a harness, a wait for safe weather, now sits on a screen in an office, updated in real time, more accurate than any person could make it by looking.

The question that started this story—***How full is this silo, really?***—gets answered before anyone has the chance to ask it.

ODVA® EtherNet/IP™