Breathing New Life Into a 40-Year-Old Extrusion Process: How Collaboration Turned Waste Into Precision

Some projects start with shiny new equipment. Others, like this one, begin with a 40-year-old hydraulic extruder and a customer who knew it could do more, if only they could control it.

The Problem

Axis Automation was approached by their customer with a familiar challenge: **improve product quality, reduce waste, and speed up changeovers on a specialty polymer extrusion line.** This polymer yields ultra-high-pressure, chemically resistant tubing, a high-value product with a long lifecycle and significant market demand. Every inch of scrap is expensive.

The extruder could produce many different tubing diameters and wall-thickness combinations, which made every changeover time-consuming and waste-prone.

But dialing in the process wasn't easy.

As tribal knowledge was lost with personnel retirement and changeover, the extruder offered only one reliably controllable variable: the internal mandrel position. Adjustments required trial and error, along with a significant amount of wasted material. Changeovers took too long, and consistency was difficult.

Axis Automation and its customer needed fast, measurable, repeatable control.

So they brought in Donald Engineering.

The Solution

1 Make the Invisible Visible

Before tightening up the process, Axis Automation installed an industrial X-ray system capable of detecting additives in the polymer. This gave real-time dimensional feedback as tubing was being extruded, finally offering the visibility needed to control the process with confidence.

2 Align the Vision (and the Variables)

Donald Engineering and Axis Automation flew to the out-of-state customer for an on-site deep dive, including a machinery review, operator interviews, and a full process walk-through.

Together, the teams defined the priority variables:

- Extrusion ram velocity & pressure control
- Mandrel positioning
- XY control of the OD tooling die for concentricity & wall thickness

With the new measurement system in place, the **goal became clear**:

Develop precision hydraulic motion control across all critical axes.

3 Engineering the Solution

The Brain Behind It All

A Delta Motion RMC200 hydraulic motion controller tied everything together:

- Closed-loop pressure + position control
- Independent control of extrusion, X, and Y axes
- Extremely precise, extremely repeatable movement

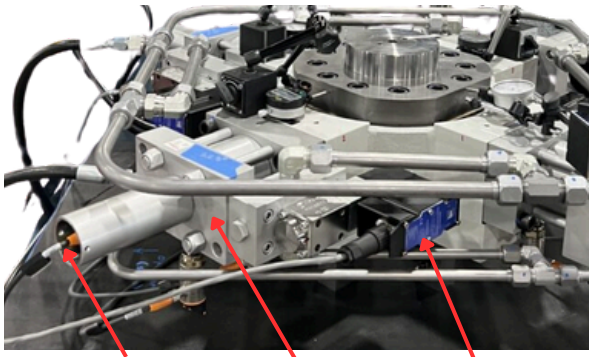
Ram Control Manifold Skid

To modernize extruder ram performance, the team added:

- Continental D08 MG & D03 MK high-speed proportional valves
- PLe safety blocking manifolds for safe gravity and hydraulic energy isolation
- An Accumulators Inc. accumulator for instantaneous response

Precision XY Die Positioning

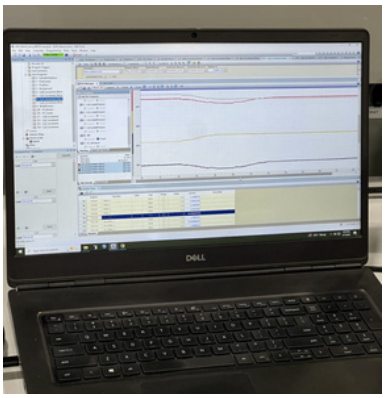
The OD tooling required exceptionally stiff, responsive motion without mechanical coupling. The past process required the technician to loosen clamps and adjust with jack screws, an ergonomic nightmare.

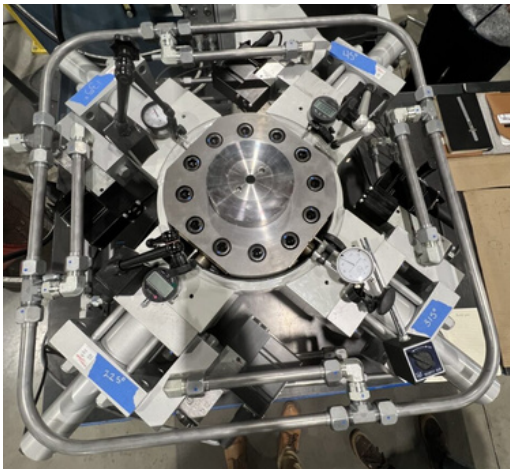


Solution: Four custom Milwaukee Cylinder H-Series cylinders equipped with:

- Integral manifolds (minimal plumbing, max stiffness)
- SSI 26-bit LVDTs with 1-micron resolution
- Pressure transducers on both ends for true force feedback
- Plus the outstanding Continental D03 MX servo-proportional valves for ultra-fine control

The cylinders operated in opposing pairs, one controlling position, the other resisting with controlled force, to keep the tooling perfectly centered and eliminate lunging as friction forces were overcome.

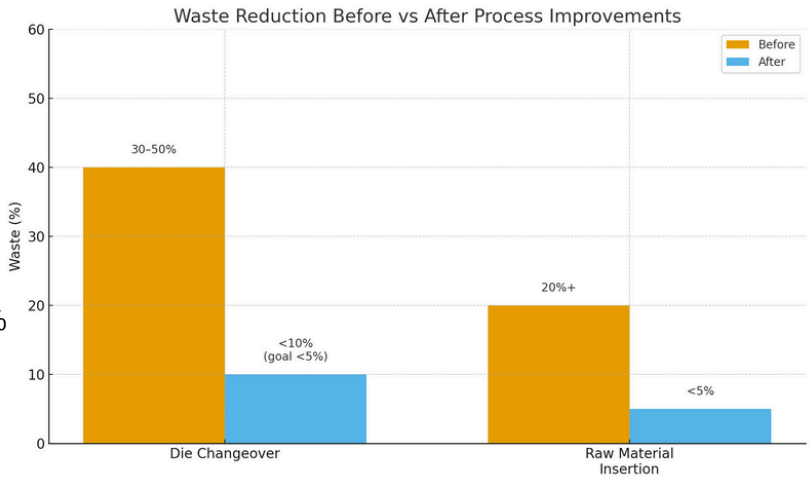




The Result: Precision Delivered

Once tuned, the system unlocked levels of accuracy that the customer didn't know were possible:

- Extrusion speed control: down to 0.001", adjustable from 0 to 0.16 in/sec
- Mandrel repeatability: via a screw actuator and electric servo
- OD die placement: customer asked for ±0.0015"
- Delivered: ±0.00025"



Waste Reduction

Before improvements:

- 30–50% waste during die changeovers
- 20%+ waste during raw material transitions

After improvements:

- <10% waste during changeovers, trending toward <5%
- <5% waste between raw material insertions

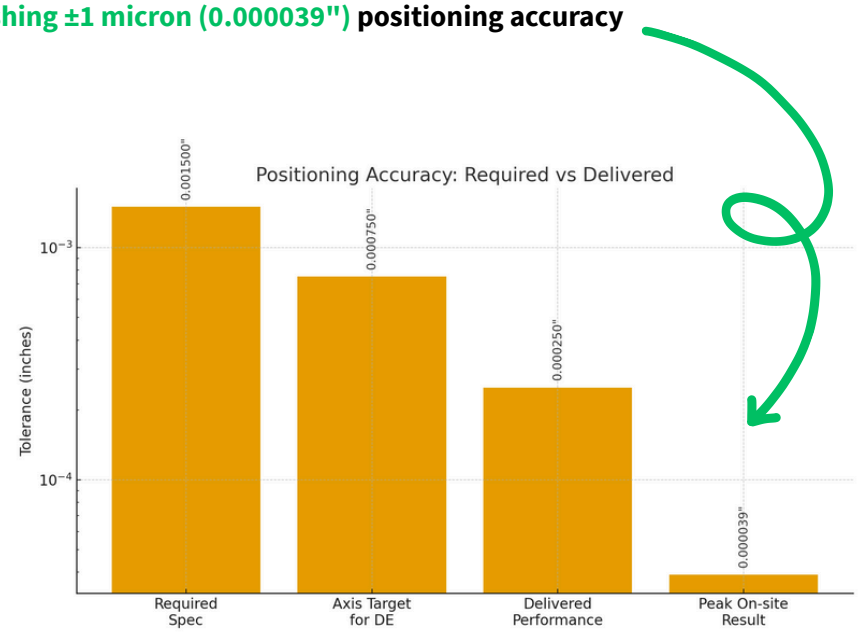
For a high-value polymer product, this is a major operational and financial win. ⭐⭐⭐⭐⭐

A Real-World Plot Twist

Not everything goes exactly as planned. Uncle Murphy made a surprise and unwelcome visit and released a contaminant from somewhere that disabled a valve. Donald Engineering and Axis Automation were once again together at the customer site to diagnose and repair. Once corrected, this issue allowed for another opportunity to fine-tune the system for even better performance, well beyond the original requirements.

On-site tuning pushed XY performance to an **astonishing ±1 micron (0.000039") positioning accuracy**

A once-in-a-lifetime performance level? **Possibly.**
A win for the team? **Absolutely!**



Collaboration That Builds Momentum

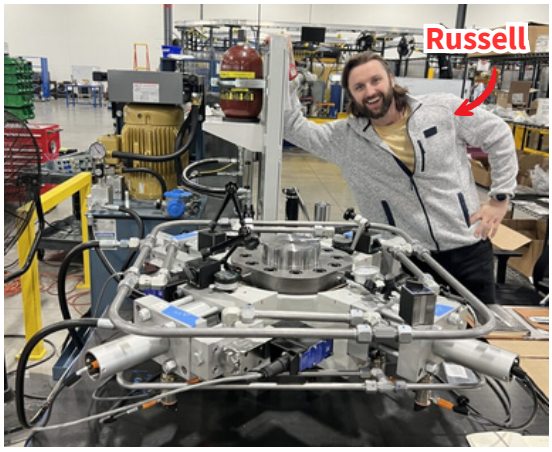
This project didn't succeed because one company had the right component.

It succeeded because three teams worked together, openly, quickly, and creatively, to transform old equipment into a modern, high-precision extrusion system.

Donald Engineering, Axis Automation, and the end customer continue partnering on additional upgrades and new applications.

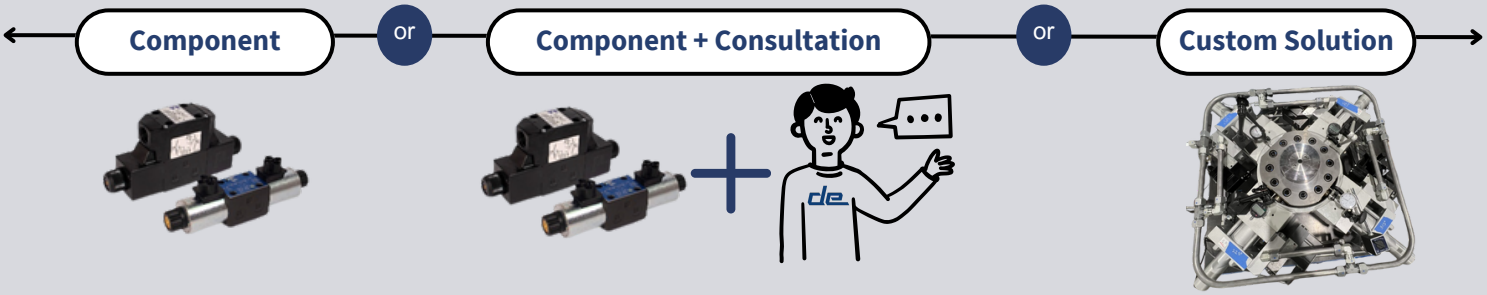
If your process could benefit from tighter control, less waste, or smarter hydraulics, we'd love to collaborate.

Let's explore what's possible with ***Partnership Driven Solutions***.



Special shout-out to Russ Hodder, Owner of Russell Logic, for partnering with us on this project!

The Donald Engineering Difference



At Donald Engineering, we believe the best solutions happen when expertise, curiosity, and collaboration come together. We help teams rethink what's possible with the equipment they already have.

From precision hydraulics to advanced motion control, our approach always centers on partnership, problem-solving, and delivering measurable results that matter on the plant floor.

Have a process challenge or an upgrade you've been considering?

Let's explore what's possible, contact our Sales Engineering team today!

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