Issue 6 June 2020

DETROIT ROBOTICS
COMPLEXITY. AUTOMATED.

RED HOT PROTOTYPING

THE COST OF NOT HAVING THE PART "NOW!"

In This Issue:

Red Hot Protoyping

The most valuable math is how to calculate the future cost of current decisions.

Prototypical

When we think of machining prototypes, typically several things come to mind.

First, by definition, the prototype is unique and usually being produced for the first time, either entirely or to the latest revision.

Second, the quantity is usually singular, or low volume.

And, of course, you need it yesterday.

We honestly can't recall a prototype part that didn't have some or a lot of urgency attached. That's par for the course when the proto part is production tooling for an assembly line, scheduled for a final testing phase, or heading into space.

Prototype purchasing is usually different too. Oftentimes, the prototype customer is an engineering or program manager, not the purchasing lead responsible for production and supply chain management.

Typically, both roles purchase quite differently.

The purchasing manager is usually concerned with costs and forecasts. Their focus is on the big picture, tomorrow as well as today.

The engineer and program manager are more inclined to be driven by urgency and uber focused on a single event, i.e., the production line, the test phase, or the launch.

Rapid prototyping is designed to meet the demands of urgency.

Managing urgency + complexity adds another layer, but a high degree of complexity is baked into most aerospace, defense, or medical prototype parts.

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Future You

Urgency now focuses the mind, and creates a dynamic path to the finish line, but often neglects to consider urgency tomorrow, or next month.

At Detroit Robotics, we work with a handful of customers who operate in a perpetual state of code red. They need suppliers who can meet their deadlines, but we found they need something else too.

We ran an internal evaluation to ask two questions:

1. What % of prototype parts were re-ordered within one year of initial production (to either the current or updated revision?)

2. How could we help customers who don't really plan, plan for tomorrow?

The answer to the first is surprising, but not really. 73% of all protypes parts were reordered within one year, 42% within three months of initial production.

Then we extended the timeframe a little. 37% of protypes parts we reordered after one year of initial production, up to 3 years out. This raised the total reorder ratio above 80%.

The pattern was pretty clear: a high majority of prototype parts will be reordered, although that was rarely a consideration when the first order was placed.

The solution was obvious, our "urgent" customers will need help tomorrow as much as today.

So, we built them a library.

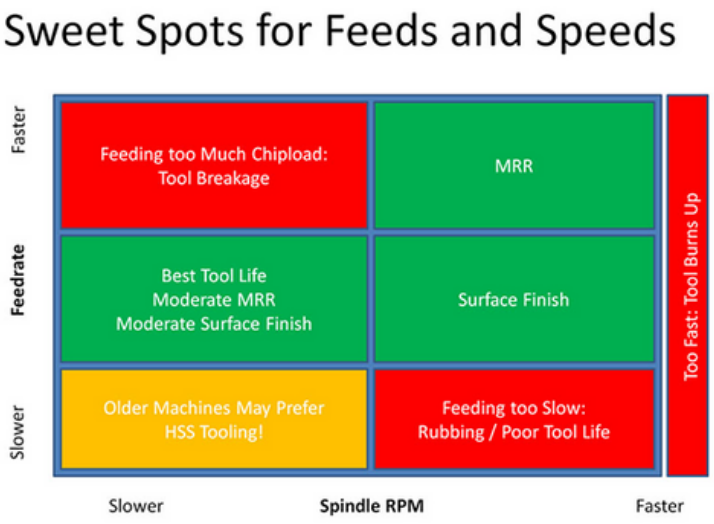
Prototype Library

The concept is simple enough and borrowed from smart machine shop best practices; the speeds and feeds library.

To the non-engineers amongst us, a speeds and feeds library is akin to a medical record.

It's a complete [digital] history of the part; how it was made, what tools were used and at what speeds etc.

At a granular level it also includes setup minutiae that, to the untrained, may seem trivial, but can bring an entire operation to a halt.



Red Hot Protoyping

Machining a prototype is like an iceberg

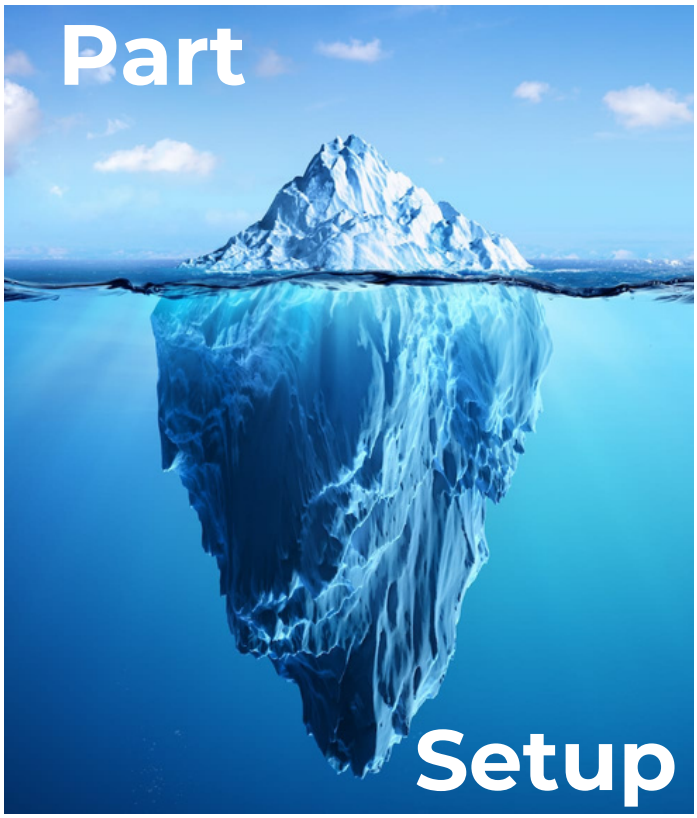
The part of the iceberg you see, the physical part itself, is the visible tip of the iceberg.

But, most of the iceberg, i.e., most of the work, lays below the surface. This includes, programming, simulation, and the entire machine setup.

If you're curious where a majority of the time and cost of the part resides, it's below the surface.

So far, so good.

But then, we had to ask the same question we ask every single time about pretty much everything: **How can we automate it?**



The setup

When you're working with complexity (geometry, features, advanced finishes, and tight tolerances) machine setup is the challenge.

When the setup is right, the machining is right.

Re-running the exact same part, even minute changes to just about anything almost guarantees a different, sub-optimal, result. The workholdings, the drills, even the darn weather (humidity) challenge precise repeatability.

Everything changes, except when you're a robot.

Robots don't forget, get bored, or lose the paperwork.

They are in a perpetual state of readiness and urgency – just like our prototype customers.

Specifically, our Hermle C-400 5-Axis cells and fully integrated HS Flex automated pallet changers. These million-dollar babies record everything, self-calibrate, and handle complexity without breaking a sweat.

Any, and we mean any, variances between today and yesterday, the Hermle recognizes and adjusts for.

Hermle automation is as consistent as a Big Mac or winter in Michigan.

THE TAKEAWAY

- Some digital machine shops sell "easy" rapid prototyping... just drop in your drawing and bingo bango. This works for lawn chairs but good luck with an aero or space part with geometric complexity or tight tolerances. Any part with tolerances tighter than 0.002 and you'll probably get a call from the "Easy" prototyper at 11:59 asking if it's OK to relax the tolerance. Of course it's not, and you just wasted a bunch of time. Detroit Robotics routinely hold tolerances to 0.0001 (ten thousandths) and love a bit of geometric complexity.

- When we get the “urgent” customer call we handle it like a hospital. We're ready and every minute counts. But, when the part is ready to ship, we like to have another conversation. We send the customer access to their NIST 800-171 compliant partitioned part library where each unique part is listed next to a super convenient “re-order” button. Hitting the button fully automates the entire production process back into motion, regardless of whether it’s 3 months or 3 years later (minus revision changes of course.)

RELATED CONTENT

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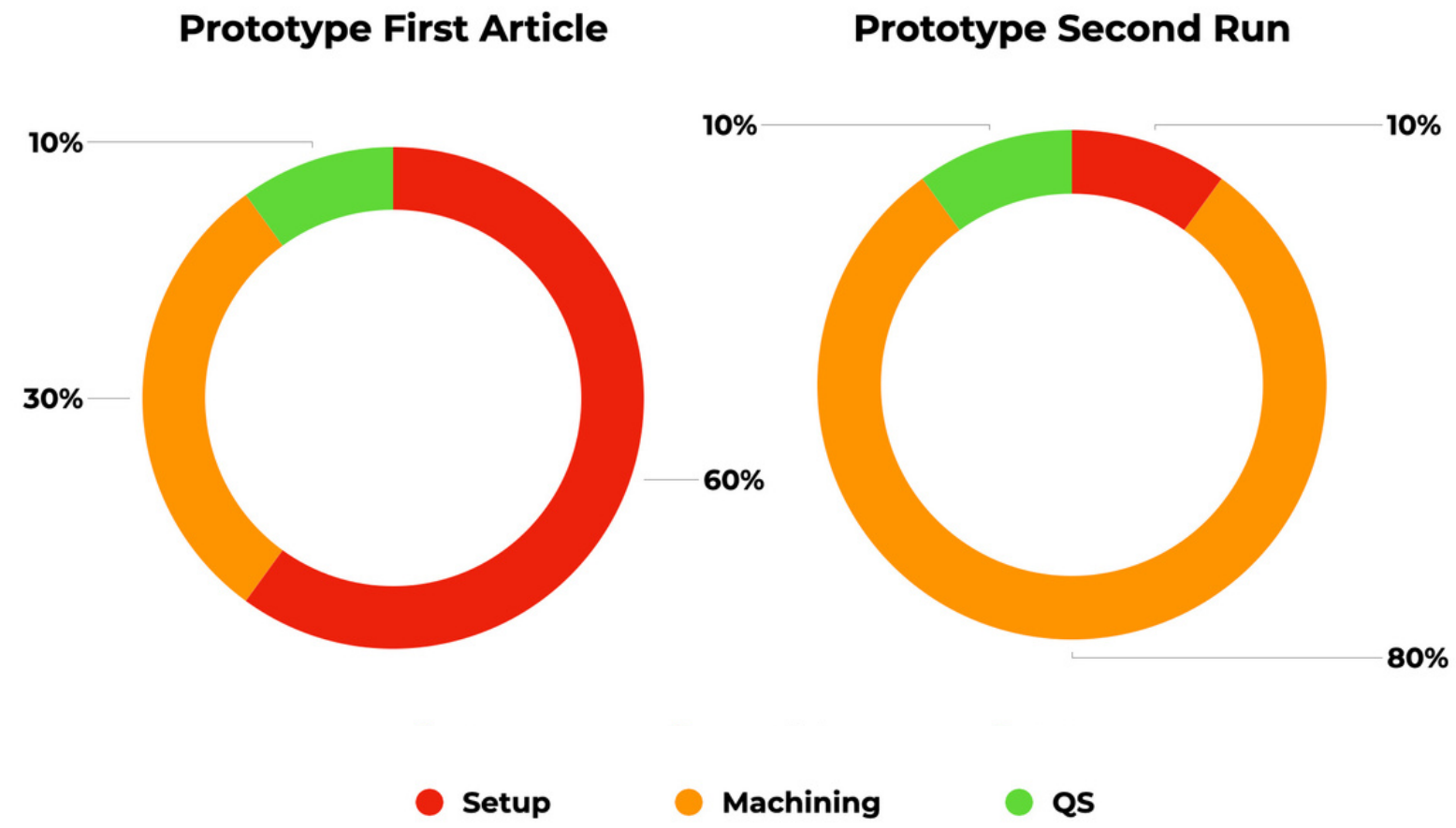
THE DATA

There is no "typical" part cycle time for prototype production. Total cycle time is a function of complexity and each machine shop's internal workflow and processes.

The graphic below simulates the typical differences between the initial vs. repeat manufacturing cycle using an intuitive automated machining cell.

Even if the 2nd prototype is subject to revision changes, revisions are "bolted on" to an existing digital framework and only add minor time elements.

The key to accelerating time for prototype reruns exists in successfully capturing and applying the data for rapid automated setup. This data resides in our extensive digital library that "remembers" the precise recipe for the unique part geometry, material, tooling setup, and machining speeds and feeds.



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