Micro

# Innovation Study:

Using VR & AR to Troubleshoot Automation

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## Contents



## Summary

Automation is great in theory. The aim is for it to achieve more efficiency and better outcomes. But rarely is it plug and play. At Micro, we must navigate what it means to integrate automation without being able to buy off the shelf and plug it in. It's led us to some out-there solutions, including how we use AR and VR to improve everything we do.

**Michael Tucci,**
**CEO and President**

# **Part I:** The challenges with complex automation

You can buy a good robotic arm, but when you're putting it all together into a large automation piece, using parts from different manufacturers, complexity increases. As you pull it all together, it might include anything from a belt drive to a magnetic drive to a rotary table, and what result an increase in moving parts that need to be managed. Complexity increases as you introduce more and more technologies, processes and hardware. As these co-exist, the chance of failure becomes an issue you need to mitigate for.

At Micro, we've had to navigate automation in scenarios where standard automation solutions don't work. So, we need to create custom solutions, but with custom solution comes custom problems. With plug-and-play solutions, problems are less of an issue because the same thing is being made over-and-over again, to a level of quality and troubleshooting that is predictable. But when we put 4 arms together and use them with different metals and plastics, all within different scenarios each time, the chance for failure increases. Add to that an exacting environment (by that we mean there is no room for failure of any kind), you're going to encounter issues to be fixed, even if minimal, because tolerance is virtually 0.

> “…but with custom solution comes custom problems.

When dealing with a simple mechanical die or injection mold, you can work it out as you go. But when dealing with automation that integrates a whole bunch of expensive and dangerous parts, all moving at once, it's hard to stick your head in there to find out what's not working or causing the issue at output.

# Part II: Our solution

In the past, we've stuck Micro cameras in the machine and run readings to try and figure out what's going on but in 2018, we've begun experimenting with AR and VR to see inside of the machine to assist now but mostly later for downstream troubleshooting.

Firstly, the ability to stand inside the machine while it's going on around you, and while it's in operation, gives you an immersive look at what's going on. The vantage pont through which you can see the inner workings provides opportunity to not just problem solve but process improve.

Secondly, this takes a lot of customization because it's so different to most applications that VR and AR are intended for. We want to use it for troubleshooting, and ths opens us several different avenues that are interesting to explore, if for instance we overlay working models over the cameras, and insert AI into the equation.

### 1. AR for improvement

In these circumstances, there could be any number of issues causing whatever problem we're facing. It can be poor design, poor execution, a general hardware miss match or just plain wear and tear. All these issues need to be addressed in different ways. So, what if we could use AR as an improvement and diagnostic analysis tool?

We first experimented with closed-loop feedback automation adjustments back in the early 90's but it was 2D and singular data points. We'd track the SPC data and give it real life tweaks based on trend data to see the impact on the next part being produced. Now with technology and AR, we could take that 2D single data point flat screen experience and turn it into a big data, immersive, 3D and 360-degree experience.

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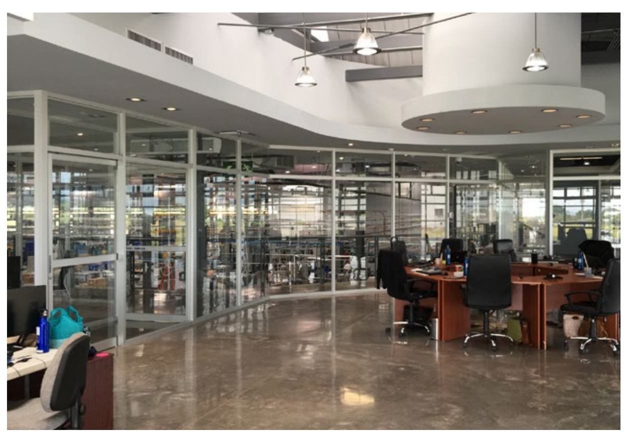
### 2. Bringing it all together

If we can see inside the machine whilst in the motion, we can in real-time see what's happening. Furthermore, if could overlay the machine model into the process, we could track ideal vs. actual and see at each part of the process whether there is optimal or sub-optimal performance.

However, the goal is to have the machine gain cognitive awareness of the difference between what working and not working looks like to notice it, let us know about it, and then even make self-corrections in real time.



# **Part III:** What's next

We aim to conduct a design tryout soon and whilst we're new to the idea, we will experiment internally and start to gather data using our own assembly line. We believe the visceral connection between seeing and feeling what is happening inside the machine could also enhance our own human problem solving capacity, comparative to staring at numbers on a screen and guessing the issues occurring. We see the whole project as 4 steps:

**Step 1**

Get the micro 360 degree cameras into our assembly line with AR working and usable.

**Step 2**

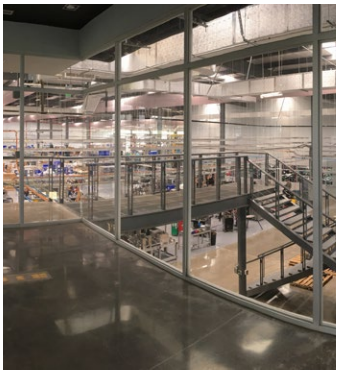
Implement the model overlay to understand how what we're seeing corresponds with the machine's optimal working rhythm.

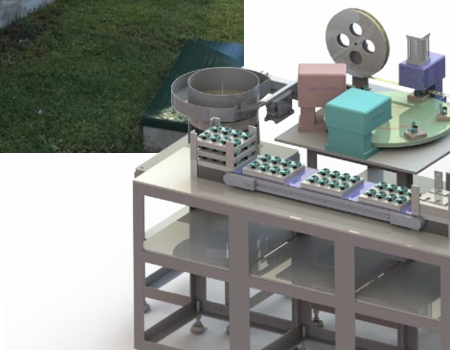
**Step 3**

Build AI machine learning into the process.

**Step 4**

Build self-correct capability to pair AI with real-time no-touch solutions.





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