Magic Leap

CASE STUDY : PBC LINEAR

A New Augmented Reality for American Manufacturing

PBC Linear innovates manufacturing operations with the implementation of Taqtile's Manifest on the Magic Leap augmented reality platform,capturing expertise and enabling new employees to be more productive.

PBC Linear

With manufacturing's aging workforce, PBC Linear needed to solve their retention and recruitment issues. So PBC Linear collaborated with Taqtile and Magic Leap to make this a reality by deploying Taqtile's Manifest augmented reality platform on the Magic Leap AR headset device. But they got so much more— including significant improvements in quality, savings, implementation times, and maintenance— all while improving employee recruitment and retention.

Customer Profile

For 35 years, PBC Linear has been a leader and trusted source of linear motion technologies for use in the healthcare, manufacturing, agriculture, and machine tooling industries. The company's more than 120 engineers, operators, and technicians design, manufacture, and deploy technically superior, complex systems and components for factory automation and manufacturing applications

Located in northwestern Illinois, PBC Linear's full scope of product categories has expanded over the years to include linear bearings and rails, patented linear guide systems, linear actuator technology, and its own, specially designed, aluminum extrusion process.

"Manifest on the Magic Leap device is essential for PBC Linear's future and the future of US manufacturing as a whole."

— **Tim LeCrone, Director of Manufacturing Engineering, PBC Linear**

Customer Challenges

Like so many American manufacturers, PBC Linear has been experiencing a departure of their most skilled and experienced workers due to an aging workforce and economic drivers that create pressure to incent older, more expensive workers to retire. In fact, in 2021, the U.S. Department of Labor reported that there were more than 425,000 openings across the country for machinists and tool and die makers. The average age of a machinist is 53 years old— representing 89% of the machinist population— and many are retiring. Decades of experience can be lost with each retiring employee.

Tim LeCrone, Director of Manufacturing Engineering at PBC Linear, said that "in the old days, we could hire apprentices—typically from high school vocational programs—and we would train them for four years before they became journeymen toolmakers or machinists." For the last decade, however, high schools in the area have not offered such vocational programs, in part because students are encouraged to attend university instead. It left "a large talent gap for us," said LeCrone.

"The Taqtile/Magic Leap solution solves a lot of our retention issues."

— **Beau Wileman, Manager, Automation and Cobotics, PBC Linear**

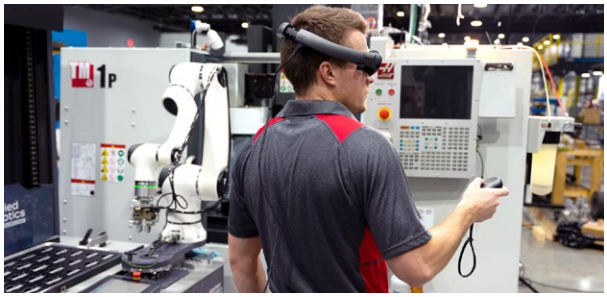
Younger workers typically lack both the baseline training for machine work as well as the process-specific experience to build PBC's seven different product lines and thousands of different part SKUs. For instance, a single manufacturing process for a part might include 50 different steps and may only be required to run twice a year. So new employees have a lot to learn and retain and they require regular guidance. And time to task competence typically takes a minimum of three weeks due to limited trainer availability. Even experienced workers must be updated and refreshed regularly. However, the retiring workforce has severely limited the availability of experts for assistance and training.

The company's turnover rate was high, and there was no dependable source of new talent. Beau Wileman, PBC Linear's Automation and Cobotics Manager, added, "Unfortunately, this issue is plaguing a lot of manufacturers. To tackle this problem, we did a lot of research and found the Taqtile/Magic Leap solution. It solves a lot of our retention issues—it gets rid of the root of the problem."

An Innovative Solution

When Wileman stumbled upon an article featuring Taqtile, he called to set up a demo of Taqtile's content platform, Manifest, an enterprise platform for capturing and distributing expertise among frontline workers. As a tool for structuring "checklist" items for a particular task, Manifest works with Magic Leap's augmented reality (AR) headset to provide machinists with procedures that contain instructions, photos, videos, pointers, and so on. And the solution enables operators to connect with experts in real time, wherever they are located.

AR technology enhances what we see in the present by bringing simulated objects and information overlays into the real world. Using AR in manufacturing enables new, revolutionary training methods where workers can learn and perfect tasks virtually in the environments where they will be performed, thereby accelerating key metrics such as time to productivity and time to resolution. Since AR breaks the limitations of the physical world, it allows humans to be co-present with each other irrespective of distance.



The Manifest/Magic Leap solution made it easy for a field-based expert to capture the knowledge initially, and then for an engineer to refine it, add more images, or update it. Wileman said, "AR is a very foreign technology to people here in northern Illinois, but our owner, Robert Schroeder, loves cutting edge technology and he quickly approved of the Taqtile/Magic Leap solution.

Of course, there was some skepticism at first from workers, but then they put on the headsets and were able to see the potential. Our interns fully embraced the idea of using AR technology but putting it into action for the more seasoned workers— around 10 machinists at first— was more difficult. It took a little convincing. They came around— I think it's the same way for anyone who hasn't tried the headset yet. But everyone who has tried it comes around easily. And in terms of creating templates, that part was very easy."

A team of engineering interns used Manifest to create 106 templates that document complex manufacturing processes with AR content that less experienced workers can quickly understand and use. Step-by-step, guided work instructions were created and enhanced with photos, videos, and 3D diagrams. Frontline workers could then complete tasks by donning the Magic Leap AR headset where these step-by-step instructions appear within their field of vision. When needed, PBC Linear was able to rehire retired expert employees on a part-time basis to work with the interns and provide specific expertise and advice on specific operational procedures.

The whole project took less than six weeks and required no programming or custom development. Content is easy to understand, and training is more interactive. And the sequential guidance and auditing features ensure that workers comprehend, not just complete, a step before moving to the next step of a procedure while training. LeCrone, despite being a self-confessed "old school" manager, is enthusiastic about Taqtile and Magic Leap's AR solution, saying, "I can duplicate myself over and over."

Several Benefits, Some Unexpected

Using Taqtile's Manifest on the Magic Leap heads up device solved PBC Linear's initial challenges, but the manufacturer found there were so many other benefits to come from the solution—benefits they did not expect to yield.

For example, PBC Linear can make new workers competent and confident to manufacture products in just three days, whereas traditional non-AR methods required approximately three weeks of training for a dedicated trainer, due to limited trainer availability. That's an 80% reduction in training time and a savings of more than $7,200 per machinist and $5,760 per intern as a result of more efficient onboarding. Additionally, PBC Linear is realizing more than $6,080 in savings per training manager. The Taqtile/Magic Leap solution has decreased the manufacturer's dependency on dedicated, experienced trainers, which are in short supply due to the aging workforce, and now, because of COVID-19 social distancing requirements.

Wileman noted, "When the pandemic first hit, our training became harder because we had to limit the number of people on the floor and limit how much time we could spend there. So, initially we tackled the first templates that were most valuable, like the lathes and other hot item machines. We focused on the most important training first so we were able to keep training going and use the solution to help walk someone through something that might not be covered well in template without worrying about exposure, social distancing, and so on. Around that time, we split into separate shifts to keep people safer and the solution made it easier to collaborate with this new shift structure in place."

The shorter times to train new workers are ultimately decreasing the downtime of machines and increasing productivity. And using Manifest on Magic Leap as an operational guide is having a meaningful impact on yields and costs. PBC is currently saving $100K a year in less scrap and redo costs due to less mistakes and more accurate job completions by more competent workers.

Additionally, the ability to send out a headset for cobot implementation or maintenance instead of a machinist or operator saves a ton of money on travel and time. Wileman said, "During COVID, if we wanted to send someone out, they'd have to quarantine at home for two weeks and once they got back, they had to quarantine for another two weeks. So, it saves us weeks of time on our side. Also, there's the travel time and expense. It is so much cheaper to send out a headset for a week or two with the domain on our license and be able to walk our customers through the AR space and then have them send it back. It's significantly cheaper."

Cobots, or collaborative robots, work directly with humans within a shared space. Taqtile's Manifest and Magic Leap provided PBC Linear a competitive advantage for cobot sales to enterprise clients. While the industry standard cost to send technicians out to the field to train clients and implement cobots is at least $20,000, PBC Linear is cutting that expense by sending Magic Leap devices equipped with Manifest, ready for enterprise client use, thereby cutting the need and cost to send a technician and opening a brand-new revenue stream for PBC Linear. Wileman specifically noted that "the ability to standardize the training and have every machine sent out with a headset makes implementation of printers and cobots so much faster and easier." To date, PBC Linear is the only one of its competitors executing this model.

LeCrone said that Taqtile's Manifest on the Magic Leap device helped them improve quality. Seasoned machinists can show a new employee all the steps and shortcuts they need to machine a quality product—without the typical four-year apprenticeship. Operators can take photos of parts and then compare them to the finished part in the Manifest instructions; visual cues are easily captured and applied in the system.

Just as important as the quality improvements was that Taqtile and Magic Leap helped them solve their talent problem. PBC Linear had several local competitors competing for their workforce, and because of the AR solution, they had a competitive advantage. New operators and machinists were enthusiastic to work with AR, and they stayed in the job for longer.

PBC Linear also cites the ease of use and comfort of the actual solution. As a toolmaker for almost 30 years, LeCrone loves that he can use the Magic Leap controller easily. With other devices, Wileman said that "the hand gestures that you need to use are difficult and inconvenient for older workers. And with the tighter spaces we have to be in, having our elbow to the side is easier, and being able to navigate is better with this device. Plus, after a few minutes, our machinists don't even realize they're wearing anything. It's very comfortable."

Looking Forward

Encouraged by their results from the AR platform, PBC Linear is looking to increase the number of users in their shop. At 40% currently, they want to get that number as high as they can. Additionally, the manufacturer plans to have five more cobot implementations for clients this year and at least 25 implementations in the next year.

"Our overall experience with Taqtile and Magic Leap has been very positive. We are seeing a lot of excitement around the headsets and the solution in general from our customers. And we've achieved some significant strides in quality, savings, and employee recruitment and retention," said LeCrone.

RESULTS BY THE NUMBERS

80%
Reduction in training time

$7,200
Onboarding cost savings per machinist

$5,760
Onboarding cost savings per intern

$6,080
Cost savings per training manager

20%
Annual savings due to less scrap and fewer mistakes

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