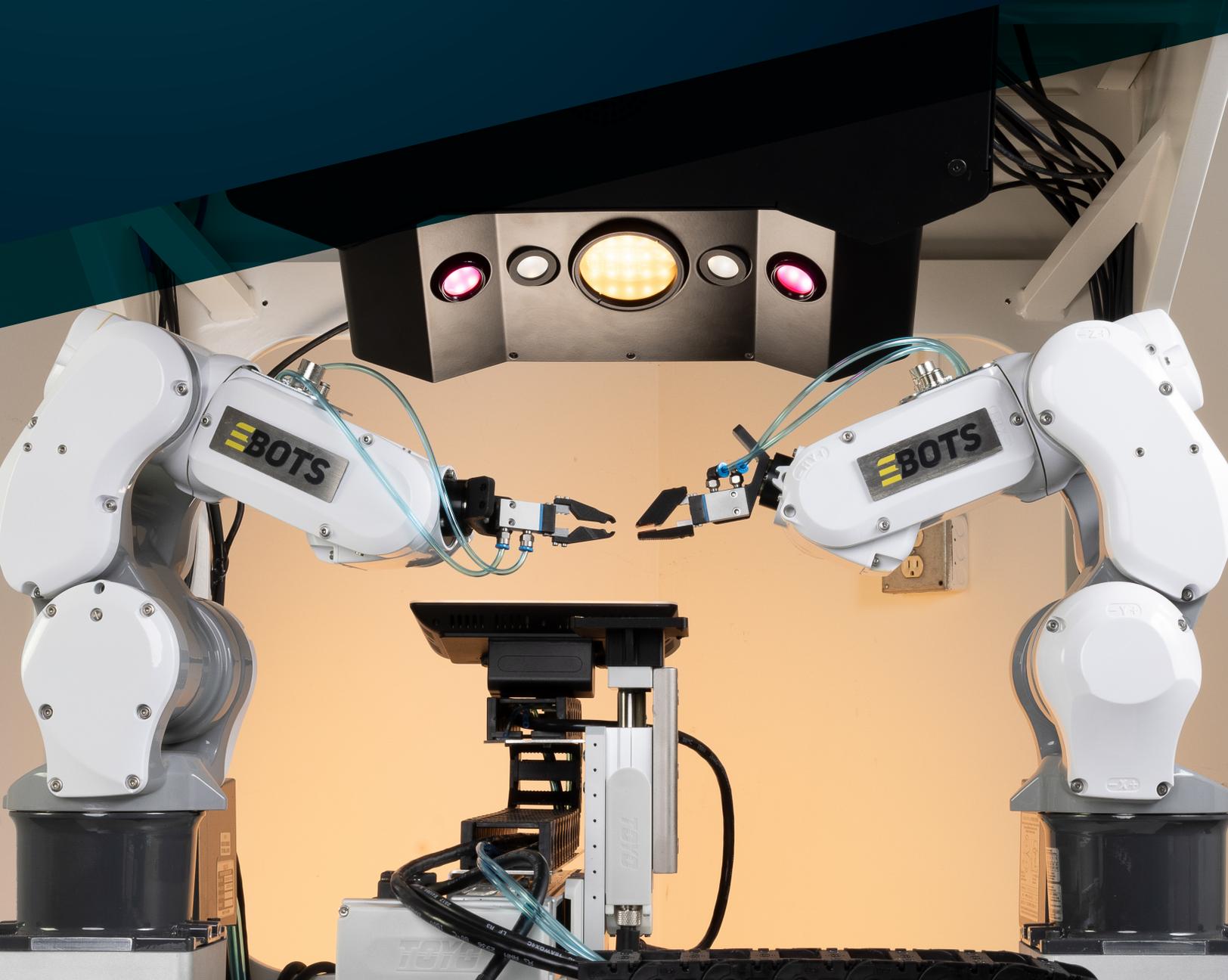


**Business Case for Automation in  
Precision Manufacturing:**

# Transforming Legacy Operations for the Modern Era



# ATTRITION

## Introduction

The manufacturing sector faces structural workforce challenges that have rapidly evolved in recent years — from simple operational concerns just a few years ago, into what’s become strategic vulnerabilities today.

With **annual turnover rates averaging 40%** amongst skilled workers in precision manufacturing roles, organizations face perpetual recruitment and training cycles that consume management’s time, attention, and financial resources. Each departed worker represents not only lost productivity but also significant sunk costs due to training and development expenses.



The growing disdain for low-paying jobs that require continuous repetitive movements, coupled with a diminishing attractiveness of manufacturing careers amongst the emerging workforce, has created a demographic challenge that has made hiring new employees increasingly difficult—and that challenge promises to intensify rather than resolve in the coming years. Even when positions are filled, the months required for new employees to reach full productivity create persistent capability gaps that directly impact delivery timelines, quality metrics, and customer satisfaction. Add to that the fact that a significant percentage of them will leave within their first year of employment, and it’s easy to see how it’s quickly becoming impossible for precision manufacturing facilities that rely exclusively on human labor to keep pace with customer demand.

While offshore manufacturing in regions like Mexico, India, China, and Southeast Asia offer lower per-workstation costs compared to U.S. operations, these savings often come with substantial hidden costs: substandard product quality, inconsistent production yields, and limited scalability. These issues rapidly transform into financial burdens through wasted materials, costly rebuilds, market delays, and diminished customer confidence.



# 40%

**Annual  
Turnover Rates**

Amongst skilled  
workers in precision  
manufacturing roles

# Competitive Pressure and Market Evolution

Precision manufacturing customers face mounting pressure in today's intensely competitive global marketplace to rapidly introduce new products while maintaining strict quality standards and remaining price-competitive in declining markets. As a result, these customers are forced to make increasingly ardent demands on their precision manufacturing partners to meet rigorous quality requirements while delivering within shortened time-to-market windows. These demands create serious challenges for precision manufacturers, especially as customer demand fluctuates significantly over time, making it difficult to balance staffing levels with cost control measures.

Despite the challenges they create, the demands customers are making are essential to their continued success and therefore show no signs of letting up in the future. **These include:**

- ! Shorter lead times with greater schedule reliability
- ! Expedited time to market
- ! Strict quality standards, including maintaining consistent quality across production volumes
- ! Competitive pricing despite rising input costs
- ! Flexibility to accommodate design changes and volume fluctuations
- ! Capability to rapidly scale production based on market opportunities

Consequently, precision manufacturers that are struggling with workforce challenges find themselves increasingly at a disadvantage compared with competitors that have successfully modernized their operations. This competitive gap based on all of the demands listed above is already present today, and is expected to significantly widen over the next few years as forward-thinking precision manufacturing leaders continue to reinvest automation-driven savings into further operational improvements.



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investments.**

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# Automation Enhances Financial Performance

In addition to having the ability to meet growing customer demands and therefore help to continue winning new contracts, next-generation automation delivers compelling financial returns through multiple value drivers:



**Operating Cost Reduction.** Advanced robotic systems reduce the recurring expenses of human work cells—including wages, benefits, training, and management overhead—while consistently delivering superior performance. For a facility with 100 work cells, annual savings typically exceed **\$15 million** in direct labor alone. In fact, for well-planned implementations, ROI periods of 6-18 months are common.



**Avoidance of Quality-Related Costs.** By achieving assembly yield rates that exceed **99.95%**, automated systems virtually eliminate expenses related to rework, warranty claims, and customer returns. These quality-related savings often contribute an additional 15-20% beyond direct labor savings.



**Improvement of Asset Utilization.** The ability to operate continuously without downtime from shift changes, breaks, vacations, or sick days dramatically improves return on existing facility and equipment investments. Many organizations report **40-60%** capacity increases without facility expansion, effectively reducing fixed cost allocation per unit produced.



**Inventory Optimization.** Production consistency enables leaner inventory management practices, which can reduce working capital requirements by **20-30%** while maintaining or improving service levels and delivery performance.

**15M**

**Annual Savings**

exceeded in direct labor  
For a facility with 100 work centers

**15-20%**

**Additional Savings**

beyond direct labor

**40-60%**

**Capacity Increases**

without facility expansion

**20-30%**

**Reduction in**

working capital requirements

# Limitations and Challenges of the Human Workforce

Human labor, while versatile, inherently introduces performance variability into precision manufacturing processes. Even the most skilled workers cannot maintain perfect consistency across shifts, days, or weeks. When we consider the natural differences in skill aptitudes between individual workers — some excelling at fine motor control while others demonstrate superior visual acuity or cognitive processing — we encounter an unavoidable spectrum of performance variability. This human inconsistency inevitably leads to fluctuations in product quality, slower production times, and higher error rates — particularly problematic in precision manufacturing where tolerances are measured in micrometers.

In addition, the human workforce presents operational challenges due to workforce shortages as the pool of skilled labor continues to dwindle, making essential positions increasingly difficult to fill. The staggering **40% annual attrition** rate forces manufacturers into a constant cycle of recruitment and training, with new workers requiring months to reach full productivity. Operational limitations further compound these issues, since human workers require breaks, have limited working hours, take vacations, and experience illness. Perhaps most critically, human workforces impose severe scalability constraints, making it nearly impossible to adjust to fluctuating production demands quickly.

These challenges make it nearly impossible for traditionally staffed manufacturing facilities to operate at full capacity consistently. These challenges often prove to be costly, as customers increasingly gravitate toward more efficient, modern operations that can meet rigorous quality standards without sacrificing time-to-market requirements—all while avoiding cost overruns.



*The staggering 40% annual attrition rate forces manufacturers into a constant cycle of recruitment and training, with new workers requiring months to reach full productivity.*

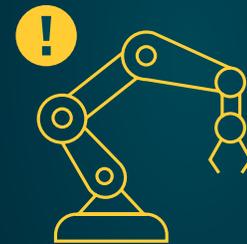
# Limitations of First-Generation Automation

Many precision manufacturers have attempted to address these challenges through first-generation automation solutions such as single-purpose robots. While these technologies have delivered benefits for some manufacturing use cases, they fall significantly short in precision manufacturing environments.

Legacy manufacturing robots typically feature a single arm programmed to perform one specific task. Some are pre-programmed and are incapable of doing anything else; reprogramming them for new tasks requires hours or even weeks of specialized work. Other, simpler models can be trained by an operator manually manipulating the arm and pushing a button when the desired task should occur, enabling the robot to “learn” when to perform each task at each specific location. While this second use case certainly delivers far greater flexibility than the first, both types lack the flexibility, versatility, and precision required for intricate assembly work. Most critically, they cannot replicate the dexterity and hand-eye coordination necessary for precision manufacturing tasks. And with only a single arm, their inability to effectively handle reformable components such as cables renders them unsuitable for many precision applications.

Regardless of the specific form factor, most automated systems can only perform simple, repetitive tasks rather than complex, multi-step processes that characterize precision manufacturing. Older systems consume more resources while delivering slower performance than modern alternatives. Perhaps most frustrating for manufacturers, adapting to new product specifications often necessitates weeks of system reconfiguration, creating unacceptable delays in an increasingly fast-paced market.

These limitations have led many precision manufacturers to conclude that automation cannot adequately address their needs, forcing continued reliance on an increasingly problematic human workforce model.



***Most automated systems can only perform simple, repetitive tasks rather than complex, multi-step processes that characterize precision manufacturing.***

# Business Case for Next-Generation Automation

Advanced automation solutions represent a paradigm shift in precision manufacturing capabilities. Unlike first-generation systems, these next-generation platforms combine AI-driven learning, 3D computer vision, cognitive processing, and synchronized dual-arm coordination to execute complex assembly processes with unprecedented accuracy and consistency.

The business case for implementing such advanced automation encompasses multiple dimensions of value creation across operational efficiency, financial performance, and strategic positioning.



## Operational Efficiency

Next-generation automation delivers remarkable operational improvements that transform manufacturing capabilities. Some systems can achieve up to **99.95%+** assembly yield rates across complex, multi-step processes, dramatically reducing waste and rework while ensuring consistent quality. This exceptional precision eliminates material waste and quality failures that plague human-operated facilities.

The accelerated processing capabilities of advanced systems further enhance operational efficiency. Operating at **409** frames per second—thirteen times faster than streaming video processing—these platforms make decisions and adjustments with superhuman speed, significantly reducing production time. Unlike the legacy systems discussed above, next-generation automation can be reconfigured in as little as **15 minutes**, enabling unprecedented production flexibility to meet changing market demands. Perhaps most significantly, advanced automation can operate continuously without the interruptions that characterize human workforces, maximizing production throughput around the clock.

**99.95%**

### Assembly Yield

Make production errors a thing of the past

**409**

### Frames Per Second

Optimize quality, efficiency, and cost-effectiveness

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## Financial Performance

The financial case for next-generation automation proves compelling under careful analysis. Advanced systems eliminate the substantial costs associated with human labor — more than **\$75,000 annually per worker** when accounting for salary, benefits, training, and turnover expenses. The superior precision and consistency of automation minimize material waste, substantially reducing material costs that often represent a significant portion of manufacturing expenses.

Quality control expenses also markedly decrease with automated systems, since the consistent, high-quality output requires fewer resources devoted to inspection, rework, and customer returns. Despite requiring initial capital investment, advanced automation solutions typically achieve return on investment within months while offering a decade-long operational lifespan. In fact, the total cost of ownership over a 10-year operational lifespan averages **30-40%** below equivalent human workforce costs. Unlike human workforces, where scaling up means proportionally higher costs, automated systems can often increase throughput without incurring equivalent cost increases, creating economies of scale that were previously unattainable.

## Strategic Positioning

Beyond immediate operational and financial benefits, next-generation automation delivers some key strategic advantages that position manufacturers for long-term success:

- ✓ Skilled workers can be redeployed from repetitive tasks to higher-value activities like innovation, process improvement, and customer engagement, enhancing the organization's capabilities and employee satisfaction. This also helps the company attract the best and brightest talent, in addition to dramatically reducing the turnover rate, since employees will have a viable career path.
- ✓ Advanced systems rapidly adapt to changing market demands and product specifications, giving manufacturers unprecedented agility in responding to customer needs — which, in turn, helps them win more business.
- ✓ Automation makes reshoring production to domestic or near-shore locations economically viable, reducing geopolitical risks and supply chain vulnerabilities that have become increasingly apparent in recent years
- ✓ Manufacturers employing advanced automation can differentiate themselves through superior quality, faster delivery times, and greater production flexibility —key competitive advantages in demanding markets.
- ✓ Investment in next-generation automation positions manufacturers to more readily adapt to future technological advancements and market changes, creating resilience in an increasingly unpredictable business environment.

**\$75K**

**Cost Cut Per Worker**

with next-generation automation

**30-40%**

**Reduction**

In total cost of ownership over 10 years of operation

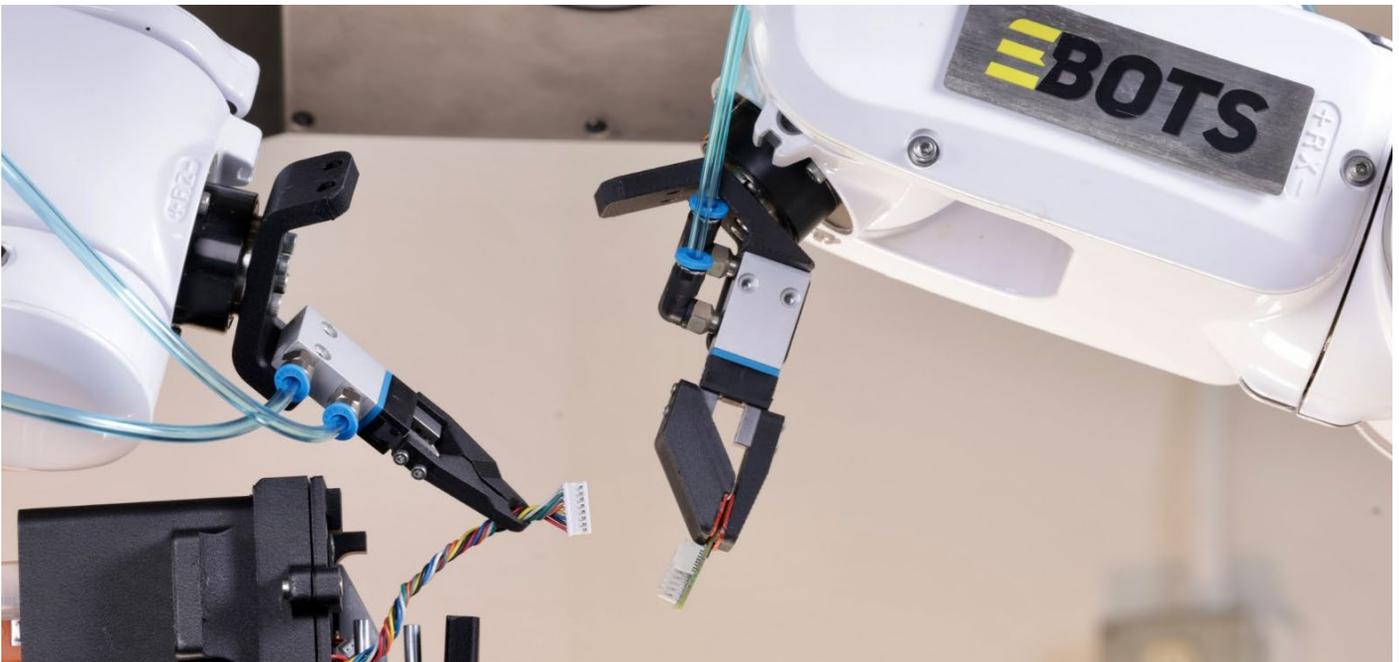
# Implementation Considerations

Successfully implementing next-generation automation requires thoughtful planning and execution. Before implementation, manufacturers should conduct a comprehensive assessment of their current operational pain points and bottlenecks, being careful to identify the processes that are most suitable for automation and calculating the potential return on investment for specific applications. Integration requirements with existing systems must also be carefully evaluated, along with facility layout and infrastructure needs to support advanced automation.

Most successful implementations follow a phased approach to deploying a next-generation automation solution.

## These steps include:

- 01 Performing a limited deployment** focused on processes that are likely to produce the highest impact to reap the greatest immediate benefit.
- 02 Evaluating performance** against established metrics to allow necessary adjustments before automation is expanded to additional processes.
- 03 Continuously optimizing the deployment** through regular assessments and improvements to ensure that the automation investment delivers maximum value throughout its operational life.



The effective implementation of automation requires that workforce impacts be addressed through comprehensive planning. Existing workforce members will require training on how to operate, maintain, and optimize automated systems, which develops valuable skills that enhance their career prospects. In addition, new roles must be developed that leverage human creativity, problem-solving, and oversight capabilities, creating more engaging and valuable positions. And comprehensive change management strategies must be initiated to address employee concerns, as well as to build worker support for automation initiatives.

CASE STUDY:

## Precision Electronics Manufacturer

To get a better sense of what next-generation automation can do for your business, consider the following case study.

A leading precision electronics manufacturer faced persistent challenges with their assembly operations. High workforce turnover (**38% annually**), inconsistent quality (**yield rates averaging 94.2%**), and limited scalability were impacting customer satisfaction and profitability. Their inability to quickly scale to meet new customer demands also cost them a number of lucrative new business contracts.

After implementing next-generation automation for their most complex assembly processes, the manufacturer achieved dramatic improvements across all key performance indicators. Yield rates increased to **99.96%**—a **5.76%** improvement that eliminated costly waste and rework while enhancing customer satisfaction. Assembly time decreased by **47%**, enabling significantly faster response to customer orders and reducing time-to-market for new products. The elimination of **\$1.2 million** in annual labor costs contributed to a complete return on investment in just **7.5 months**, creating immediate financial benefits. Production capacity increased by **112%** without requiring facility expansion, enabling the manufacturer to pursue new business opportunities previously beyond their capabilities.

Most significantly, the manufacturer didn't have to eliminate a single position. Instead, the workers and robots worked side-by-side, with the robots effectively filling the gaps left by the organization's inability to recruit and retain enough skilled workers. As a bonus, the organization was able to redeploy their most skilled workers to process improvement and innovation roles, resulting in additional productivity enhancements across non-automated processes and creating more engaging work environments for valued employees.

**99.96%**

**Yield Rate Increase**

**5.76%**

**Improvement**

Eliminating costly waste and rework

**47%**

**Assembly Line Decrease**

Reducing time-to-market for new products

**112%**

**Production Capacity Increase**

Creating new business opportunities

## Conclusion

Next-generation automation represents a transformative opportunity for precision manufacturing operations. By combining human-like dexterity with machine-level precision and consistency, advanced systems are able to address the fundamental limitations of traditional human workforces, as well as first-generation automation.

The business case for implementing these solutions extends beyond simple cost reduction. Next-generation automation enables precision manufacturers to fundamentally transform their operations — improving quality, accelerating production, enhancing flexibility, and strengthening competitive positioning.

As customer demands for higher quality, faster delivery, and greater customization continue to intensify, precision manufacturers must evaluate whether their current production approaches can meet these escalating requirements. For many, next-generation automation will prove to be essential to long-term viability and success.

By carefully assessing their specific needs, developing a strategic implementation plan, and thoughtfully addressing workforce implications, precision manufacturers can leverage advanced automation to transform legacy facilities into high-velocity centers of manufacturing excellence that are fully prepared to thrive in an increasingly competitive global marketplace.

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Keith Dussia  
VP of Sales, Ebots

