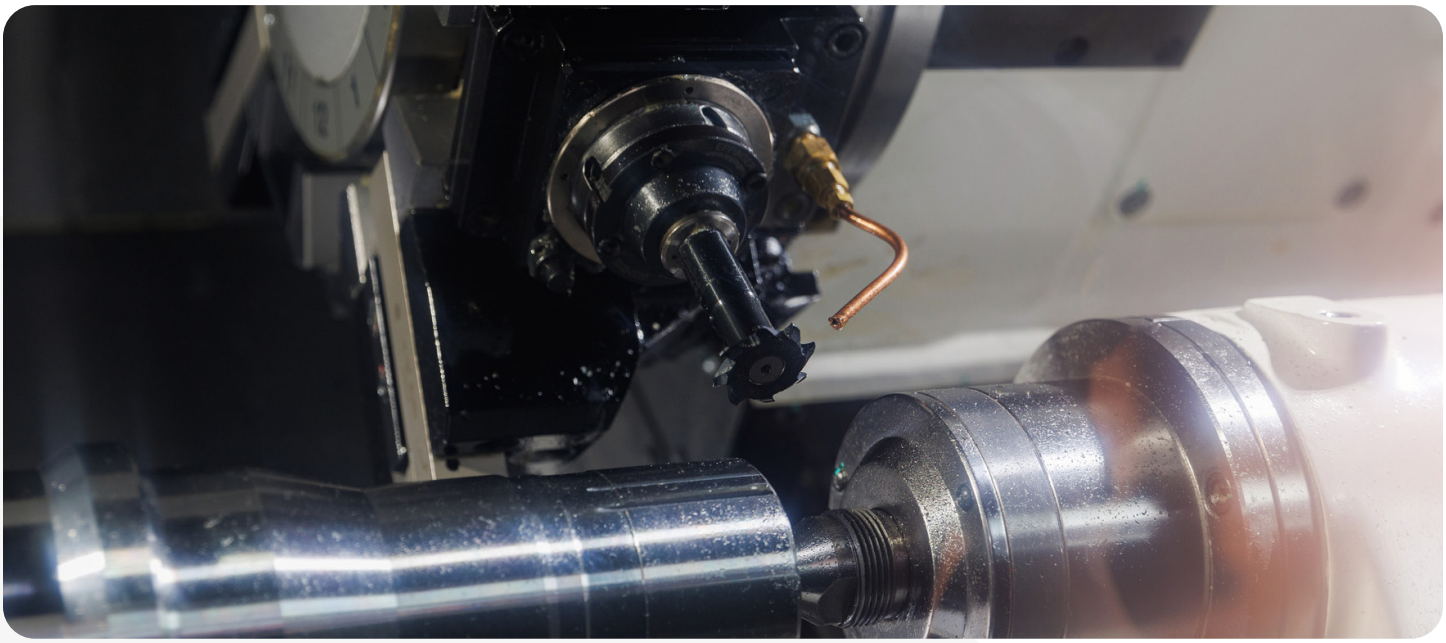
DPI INC.
PRECISION MACHINING

5-AXIS AUTOMATION CASE STUDY

Eliminating an 8-Operation Workflow
Through Multi-Machine Consolidation



DPI re-engineered a long-running 303 stainless component that previously required eight separate operations across multiple machines. The legacy process depended on custom fixtures, extensive deburring, and operator-driven setups, creating production bottlenecks, inconsistent results, and months-long timelines for even moderate batch sizes.

Although the spindle time averaged about 45 minutes per part, the true constraint wasn't cutting time, it was the multi-machine coordination, fixture handling, and scheduling delays that stretched each run across calendar months.

By redesigning the workflow around 5-axis machining and dovetail fixturing, DPI consolidated all eight operations into just three. The result is a modernized, scalable, lights-out-capable process with dramatically higher throughput and far greater stability.

2800 Turnpike Drive Hatboro, PA 19040
P: 215.953.9800

THE CHALLENGE: A PROCESS STALLED BY COMPLEXITY

The original manufacturing approach required:

· Eight total operations (six milling ops, two turning ops)

· Multiple machines to complete each batch

· 23 hours of total setup time per batch

· Custom fixtures for both milling and lathe work

· Extensive deburring between operations

· High scrap driven by setup variability

· Operator-dependent processes requiring top-tier skill

· Scheduling bottlenecks across departments

· Months-long queueing to complete hundreds of parts

The machining was never the real bottleneck, the process lived on too many machines, each adding setup time, variation, and delays that compounded over the entire job.

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DPI'S SOLUTION: A FULLY RE-ENGINEERED 5-AXIS WORKFLOW

Key Improvements

· Eliminated all lathe operations

· Removed all custom fixtures

· Consolidated 8 operations into 3:

  o Op 1: Simple 3-axis

  o Op 2: Fully optimized 5-axis (lights-out capable)

  o Op 3: Simple 3-axis

· Reduced total setup from 23 hours to 14 hours

· Designed a four-part dovetail fixture for increased cycle density

· Enabled 2 hours of unattended machining during Op 2

· Removed most deburring through better access and toolpath strategy

· Shifted the job to run on one or two machines instead of many

Although spindle time only decreased from ~45 minutes to ~43.75 minutes, the meaningful gains came from eliminating handling, queueing, setups, and fixture steps, the true drivers of throughput.

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RESULTS

Productivity

· Effective throughput increased far beyond 4×

· Hundreds of parts can now be produced in weeks, not months

· 2 hours of true lights-out runtime per cycle of Op 2

· One or two machines can now handle the entire job

· Setup time reduced to 14 hours from 23

· Hundreds of operator hours eliminated

Quality

· Scrap significantly reduced

· Part-to-part consistency improved

· Datum structure fully controlled in a 5-axis environment

· No fixture-related variability

Cost Efficiency

· Lower labor cost per part

· Less deburring and rework

· Freed machine capacity for other production work

Scalability

The job shifted from “nearly impossible to scale” to “highly scalable.”

The streamlined process clears machine queueing, accelerates turnaround time, and supports repeat orders without compromising lead time or quality.

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CONCLUSION

By transforming an eight-operation, multi-machine workflow into a consolidated three-operation system, DPI unlocked major gains in throughput, stability, labor efficiency, and overall cost structure. What once required months of scheduling coordination can now be completed in a fraction of the time, with improved accuracy and consistent results.

This case study highlights DPI's strength in process engineering, 5-axis optimization, and scalable production solutions that help OEMs reduce cost, increase output, and build more reliable supply chains.

215.953.9800

www.dpicnc.com

215.953.1540