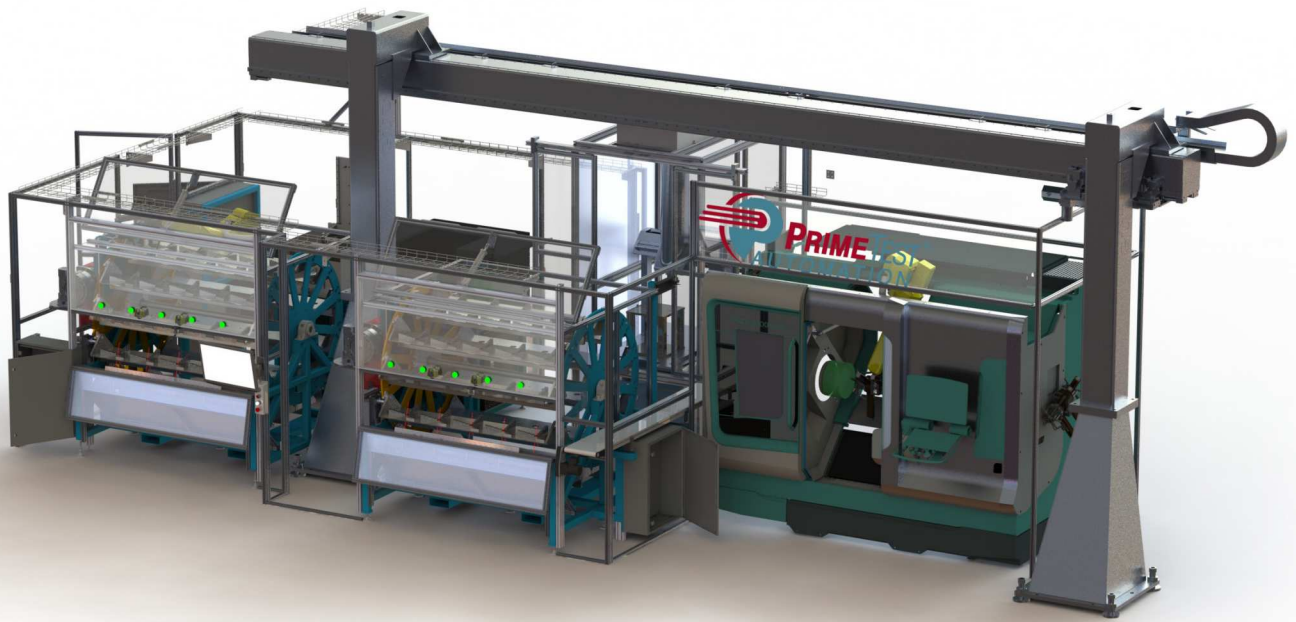


Multiprocess CNC Machining

PrimeTest® Automation's Robotic Machine Tending, Inspection, and Marking System



Industry

CNC Machining, Networking, Fabricating,
General Manufacturing, Material Handling



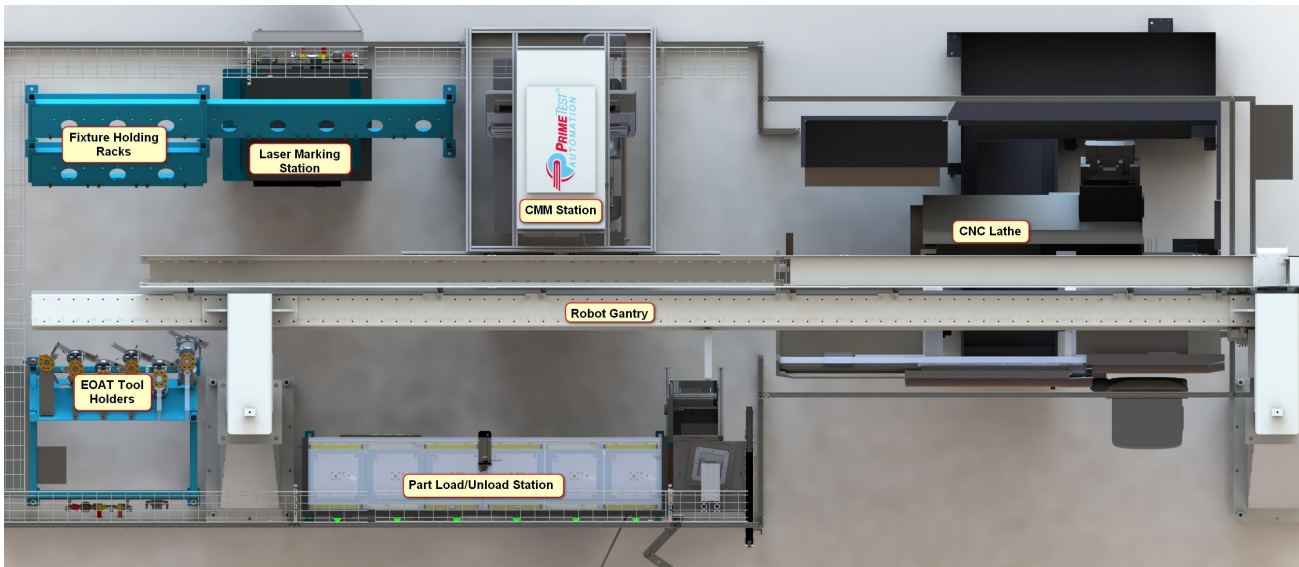
Processes

Combining multiple Güdel technologies and components
to provide robotic tending of CNC machines and
CMM dimensional verification



Key Data

- Robot tending boosts CNC, CMM work cell productivity
- System enables machining of parts with hundreds of different dimensions with accurate part positioning and placement
- Improved quality, reduced costs, improved customer relations and production capacity



Layout developed by PrimeTest® for plastic parts using a FANUC M-20iA/20M robot and a Güdel TMO-I-C module



PrimeTest® Automation's Robotic Machine Tending, Inspection, and Marking System

Operating a CNC machining company that processes hundreds of part numbers demands new approaches to improve efficiency. But automating systems with a wide range of part requirements necessitates careful planning and execution. PrimeTest® Automation, a systems integrator in Boca Raton, Fla., created an optimized solution that benefited its customer, a CNC part manufacturer, so much that it became a catalyst for business growth.

This CNC part manufacturer was operating a batch process with multiple operations consisting of machining, CMM measurement, laser marking and protective coating with rust inhibitor. Personnel were needed to handle the parts in and out of each process and to move bins of parts between the various machines. The parts to be moved weighed from under 1 kg up to 20 kg, and there were hundreds of parts to handle. Every handling operation added the risk of damage or inaccuracies in placement. Something new was needed to increase the reliability of the system throughput.

PrimeTest® Automation was called in to analyze the process and develop options. Since machining cycle times were

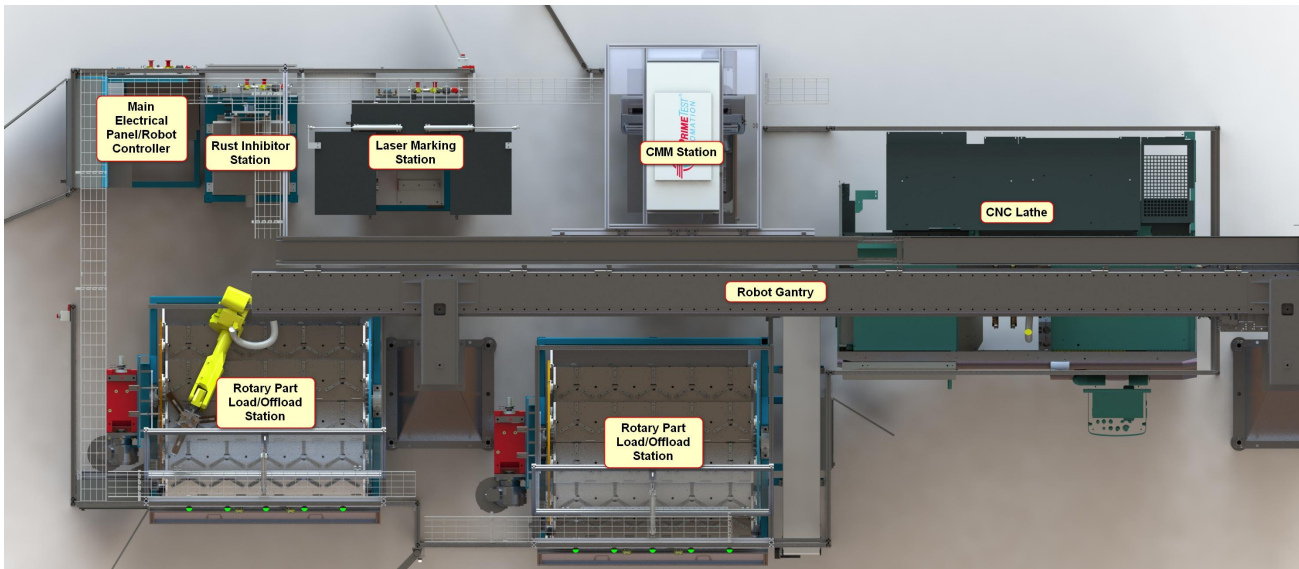
relatively long (up to five-plus minutes), there was time to use a single robot to do transfers between all the process steps if there was sufficient robot reach. PrimeTest® evaluated the option of using a large stationary robot versus moving a smaller robot on a seventh-axis track. PrimeTest® determined that configuring the machines in a linear fashion using a FANUC M-20 robot on a track was the most space-efficient way to proceed.

“The customer brought us a challenging application with many unique and difficult requirements, such as the large number of part SKUs, very tight accuracy, significantly changing part geometry and large variances in weights,” said Kevin Hayes, Director at PrimeTest® Automation. “With those requirements as the base, our engineering teams, including mechanical, electrical, controls and software, truly stepped up by utilizing their creative problem-solving skills in conjunction with powerful building blocks from Güdel, FANUC and many others to provide an outstanding solution that hit all the marks.”

Güdel's Bob Rochelle, Regional Sales Manager, adds, “The project started with FANUC referring Güdel to PrimeTest®



Güdel TMO-C TrackMotion Overhead



Layout developed by PrimeTest® for metal parts using a FANUC M-20iA/35M robot and a Güdel TMO-2-C module

for the overhead track requirement for the system design. The project's success, plus the second system ordered for the same end user, can be attributed to the FANUC, Güdel and PrimeTest® team working together."

PrimeTest® selected a Güdel TrackMotion Overhead (TMO) module to move the FANUC robot between operations while optimizing floor space utilization. The module's carriage moves an inverted FANUC robot using a seventh-axis FANUC servo motor, which is also controlled by a FANUC R-30iB+ robot controller. Full stroke for the robot carriage is 7.9 m (26 feet). The Güdel TMO features a repeatable and reliable rack-and-pinion drive with a Güdel HPG worm gearbox and a Güdel helical rack. In addition to these Güdel components, the TMO module is built with Güdel guideways and the Güdel roller block system, with industry-leading, quickly replaceable rollers. Güdel provided customized legs to place the module at the correct height for the work cell and sized it so that only two legs were needed.

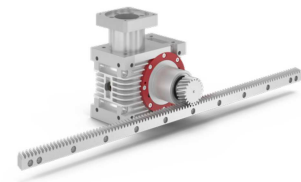
Since the two systems required different payload capabilities, PrimeTest® had the opportunity to "right size" both the robots and the tracks. The plastic part system needed the FANUC M-20iA/20M

robot, with 20 kg payload capability, while the metal part system needed the FANUC M-20iA/35M, with 35 kg capability. Güdel was also able to "right size" the TMO modules using the TMO-1 and the TMO-2.

The customer initially contracted for two systems: one for processing metal parts and the other for processing plastic parts. The customer was so impressed with the system concept and with how PrimeTest® managed the project that prior to the two systems being completed, the customer ordered an additional two systems.

But developing the layout was only part of the story. Manufacturing hundreds of parts through an automated system requires understanding how to handle each part in each required orientation for each process. PrimeTest® was able to define a limited number of tools that could each handle a range of part designs in their pre-machined and post-machined states. Using ATI tool changers, a robot could automatically change tools based on the part number to be run.

To support batch-size-of-one part processing, PrimeTest® incorporated barcode scanning to identify the part being loaded into the process. Each machine in the process is connected



Güdel HPG Worm Gearbox



Güdel Helical Rack and Pinion



ATI tool changers with vacuum tools for plastic parts



Three jaw grippers for metal parts

to a control system that communicates the part number so that the required part-specific programs can be automatically loaded at each operation.

PrimeTest® also developed flexible part delivery systems to handle the range of part sizes. The plastic parts are presented to the system in stacks in a cassette stand, while the metal parts are presented in a space-efficient rotary carousel.

Additionally, PrimeTest® incorporated in-line CMM measurement of parts immediately post-machining. The process allows the CMM to provide feedback to the CNC in a closely coupled manner. Tooling offset corrections can be made if part machining has gone out of tolerance. The data collected on the parts go into an SQL database, which is accessed and populated by PrimeTest®. The database and associated analysis tools manage all the part machining data, efficiently allowing for process optimization.

After measurement is complete, each part is marked in a station provided by PrimeTest® that makes use of a Telesis laser marker.

PrimeTest® chose to control an entire system and provide the human-machine interface (HMI) on a PC running LabVIEW, utilizing cRIO 9040 from

National Instruments. Ease of use was a major area of focus, and this control platform allows all the various machine controls to communicate effectively.

The benefits of these new systems to the CNC part manufacturer include:

Improvements to Quality

- Reduced production of out-of-tolerance parts
- Repeatable placement of parts in each process
- Improved machining analysis
- Cutting process improvement

Reduction of Cost

- Minimized part-handling labor
- Minimized programming labor
- Minimized changeover labor
- Reduced floor space
- Increased production capacity
- Reduced inventory due to the ability to process single parts
- Effective layout with optimized equipment for low total cost of ownership

Business Benefits

- Increased customer satisfaction with part quality and delivery timing
- New contracts resulting from increased capacity



Güdel TrackMotion Overhead (TMO) carrying FANUC M20iA/35M robot



Machining of parts in a DMG Mori CNC lathe

“Güdel was extremely helpful with their customization of the support structure for their rail system, which allowed us to bring the complex system through design and into operation,” Hayes said. “The customer was pleased to let us know that the quality and throughput of our systems provided significant improvements in comparison to their existing process. I believe that the best compliment of our system came from their operators, who strongly requested parts produced from the PrimeTest® Automation system rather than existing manufacturing methods.”

By combining database, controls, robotics, end-of-arm tooling and track capability, PrimeTest® Automation created two extremely efficient and reliable automated systems that helped this CNC manufacturer increase profitability with the business they had and open opportunities for new business.

About PrimeTest® Automation

PrimeTest® Automation is a full-service systems integration company that provides custom automation solutions including material handling, assembly, and test and measurement. Our talented in-house team of mechanical, electrical and software engineers models all systems using the latest in 3D design software. All systems are manufactured in our facility located in Boca Raton, Florida. PrimeTest® Automation offers complete turn-key automation solutions that are deployed across North America and Europe in the automotive, aerospace, oil and gas, medical, military and commercial industries.

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About Güdel Inc.

Güdel Inc. is the US subsidiary of Güdel Group, a global manufacturer of robotic automation products, systems and services. Güdel supplies linear-motion modules, robot track motion units, gantry robots and components to OEMs, systems integrators and machine builders serving the automotive, aerospace, logistics, heavy industrial and power generation industries. Güdel Inc. is located in Ann Arbor, Michigan, in a dedicated 45,000-square-foot facility, providing North American customers with engineering, design, production and customer service support.

Güdel Group was founded in 1954. Headquartered in Langenthal, Switzerland, today Güdel operates in more than 30 locations worldwide.

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