

Robotic Processing of Automotive Composite Parts Improves Safety & Efficiency While Cutting Costs



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Safety reasons

- **Robotic automation leads to safer and more efficient manufacturing.**
- **It also allows companies to remove employees from a harsh working environment.**
- **Reduces workers' compensation claims for:**
 - **Respiratory problems**
 - **Hearing losses**
 - **Carpal tunnel syndrome**

Safety improvements

- In a manual trimming operation, operators must be guarded with personal protection equipment so they are isolated from contact and inhalation of dust.
- With an enclosed router trimming or water jet cutting cell, the dust is contained within the enclosure
- This keeps employees safe from these harsh conditions.



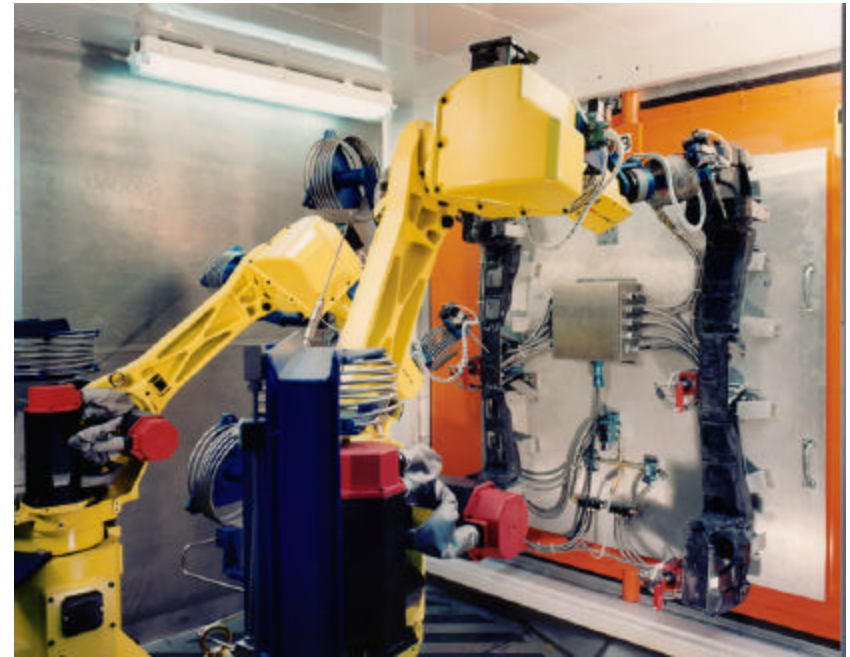
A more efficient operation

- **Companies benefit from gains in speed of their manufacturing process**
 - The high programmability and repeatability of robotics allows for a speedier operation.
- **Increased throughput**
 - Highly intensive manual operations are replaced with robotic automation which can accommodate a variety of product configurations.



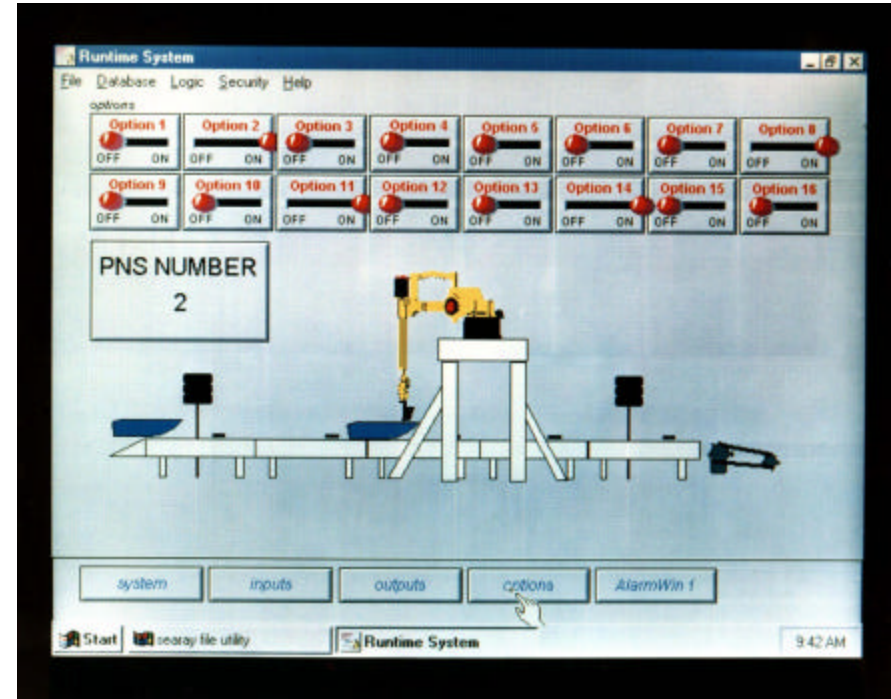
Benefits over drill presses

- **Single point of loading**
- **Multiple part styles on same machine**
- **Productivity improved with just less than 3 seconds of time when wall rotates**
- **Engineering changes made quickly**
- **Low re-tooling costs**
- **Water jet cutting is clean cut with no dust**
- **Non-contact cutting allows for less damage to the part**
- **Less fractures to the material since there is no contact.**



Quality improvements

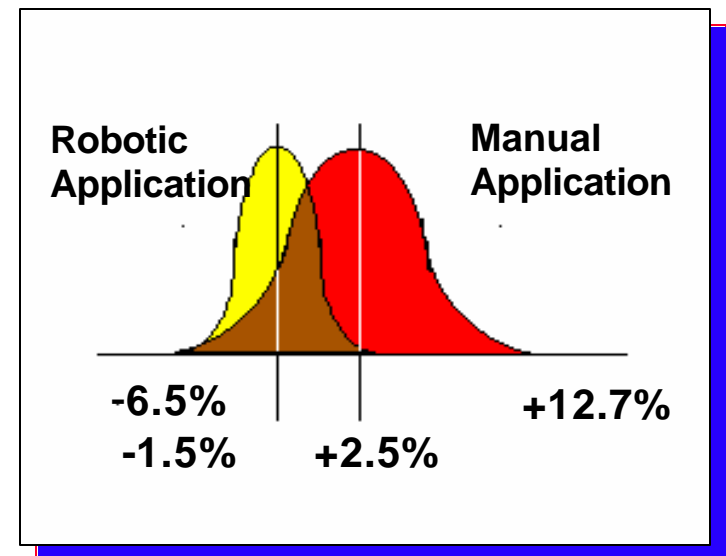
- **Improved quality**
 - Part options can be selected automatically through bar coding or other automated identification techniques.
 - This reduces operator error and helps companies reduce scrap and improve inventory control.
 - High-reject manual operations are replaced.



Cost savings

- Reduced tooling requirements since parts can be grouped into families of parts to minimize dedicated jigs or fixtures
- Robots can be programmed to accommodate many part styles and options
- Material savings with fiberglass chop and gel spraying application due to higher consistency and repeatability of robotics

Watercraft Manufacturer



■ = Material Savings

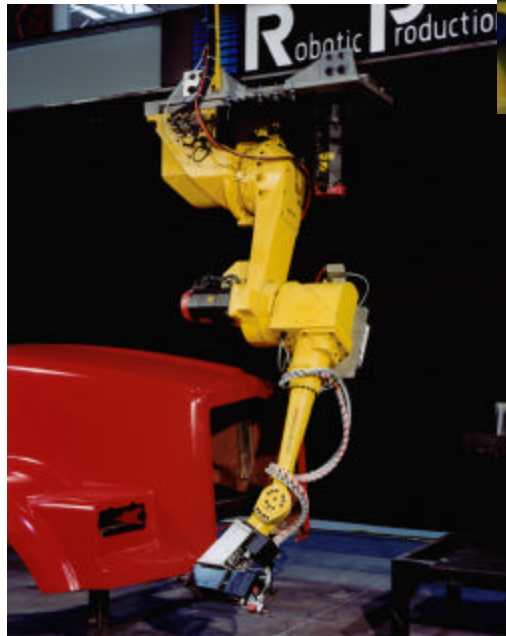
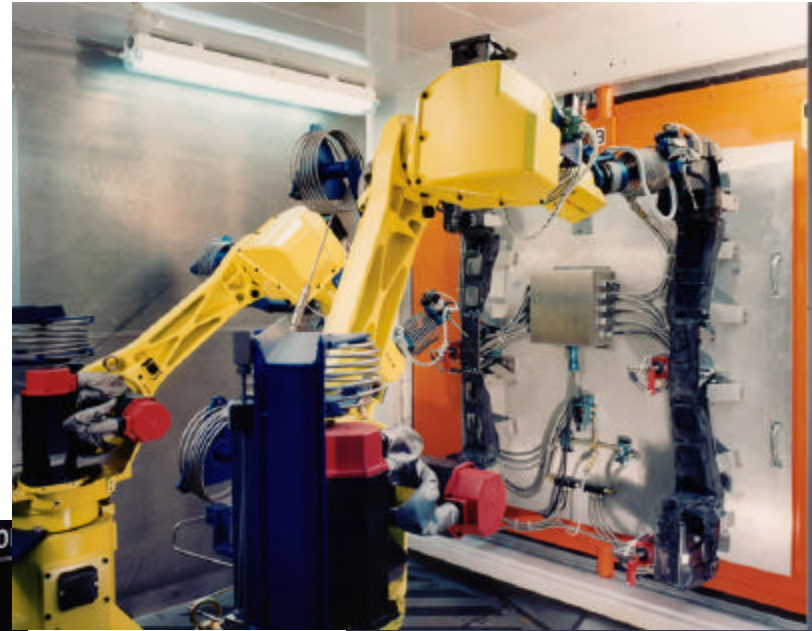
The bottom line

- **How does adding flexible automation affect your bottom line?**
- **Companies will realize significant savings by incorporating robotics and automation.**
- **By automating these processes, composite manufacturers will lower the cost in their labor-intensive operation and improve the working environment for their employees.**

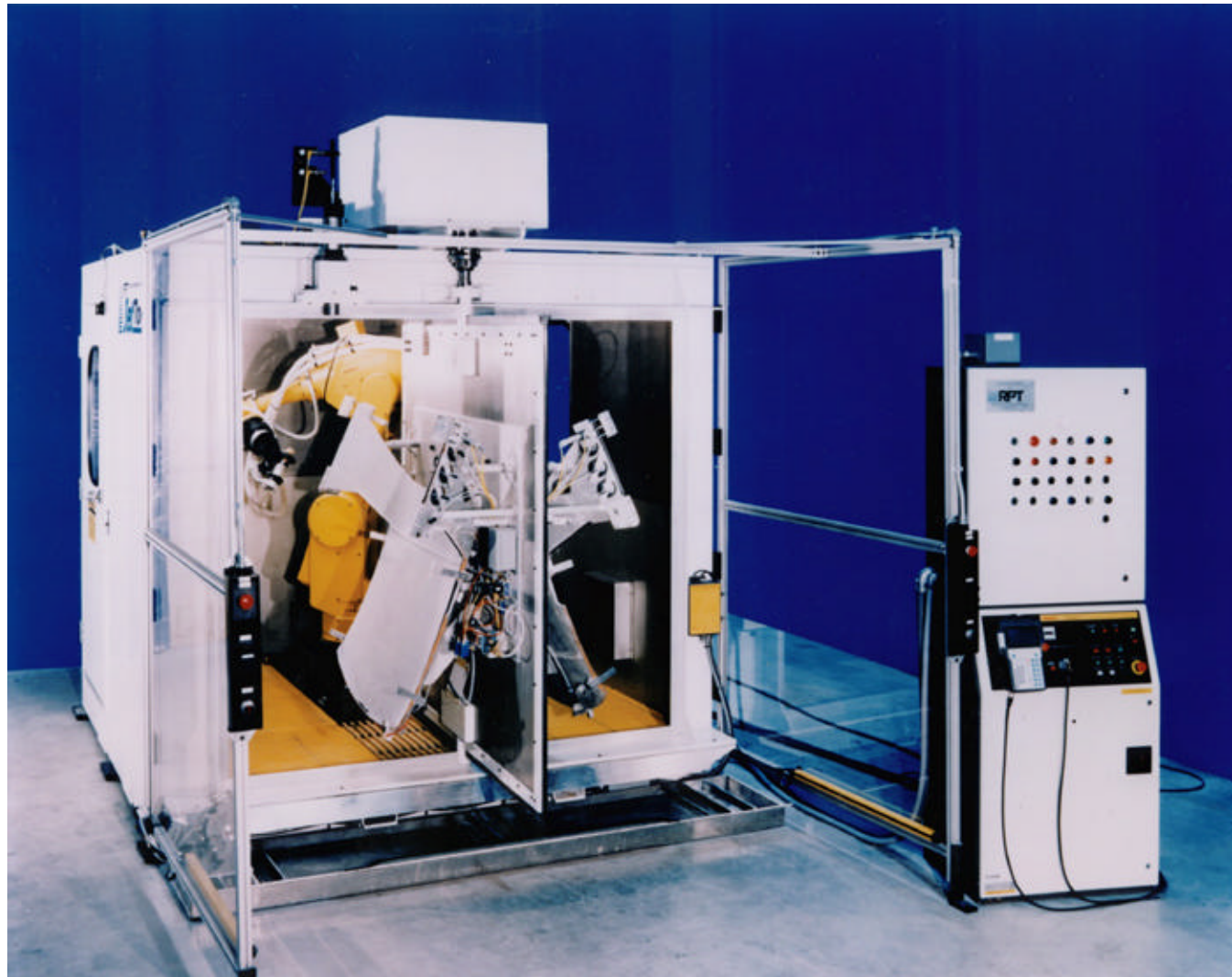


Robotic applications for composites

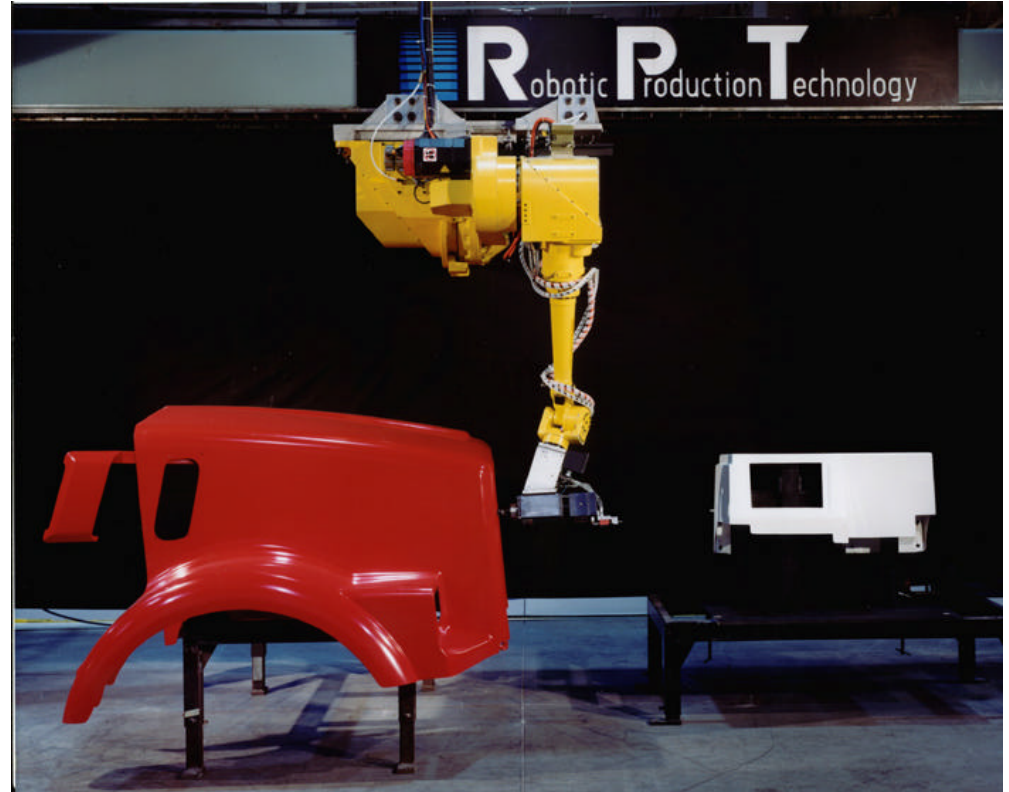
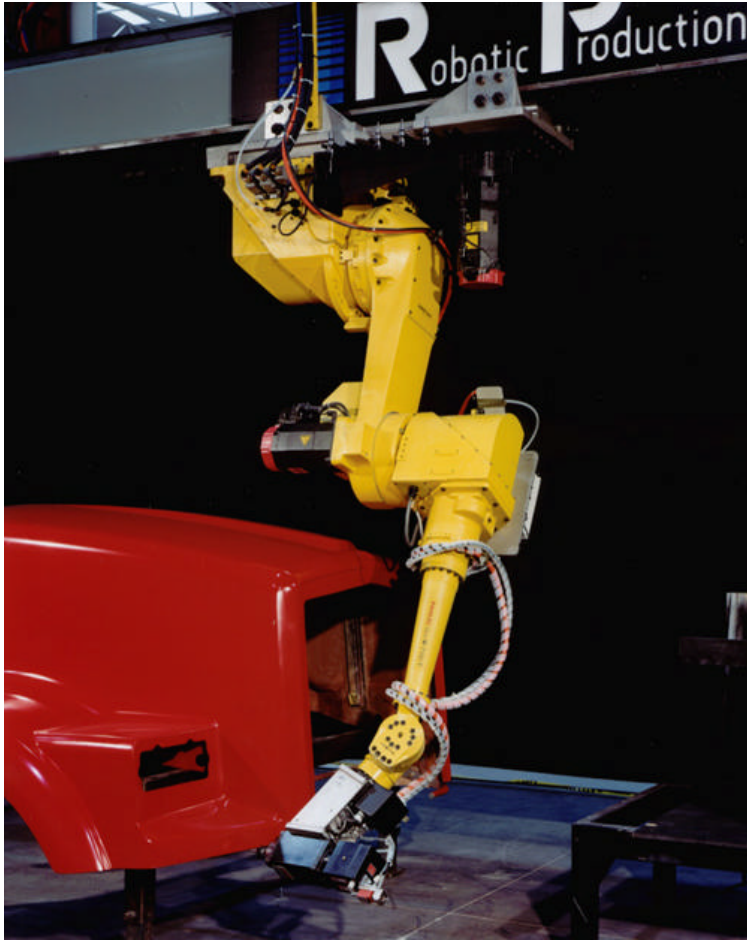
- Router trimming
- Water jet cutting
- Dispensing
- Material handling
- Fiberglass chop & gel spray application



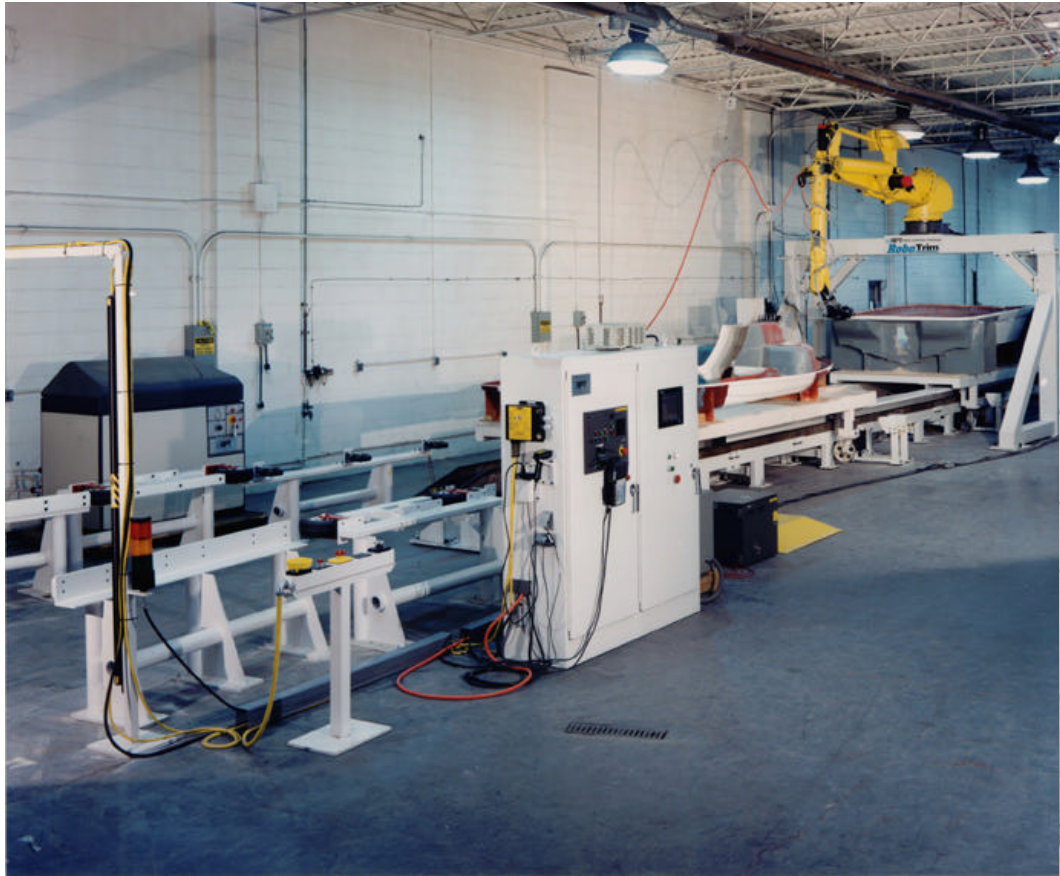
Router trimming of composites



Router trimming of composites

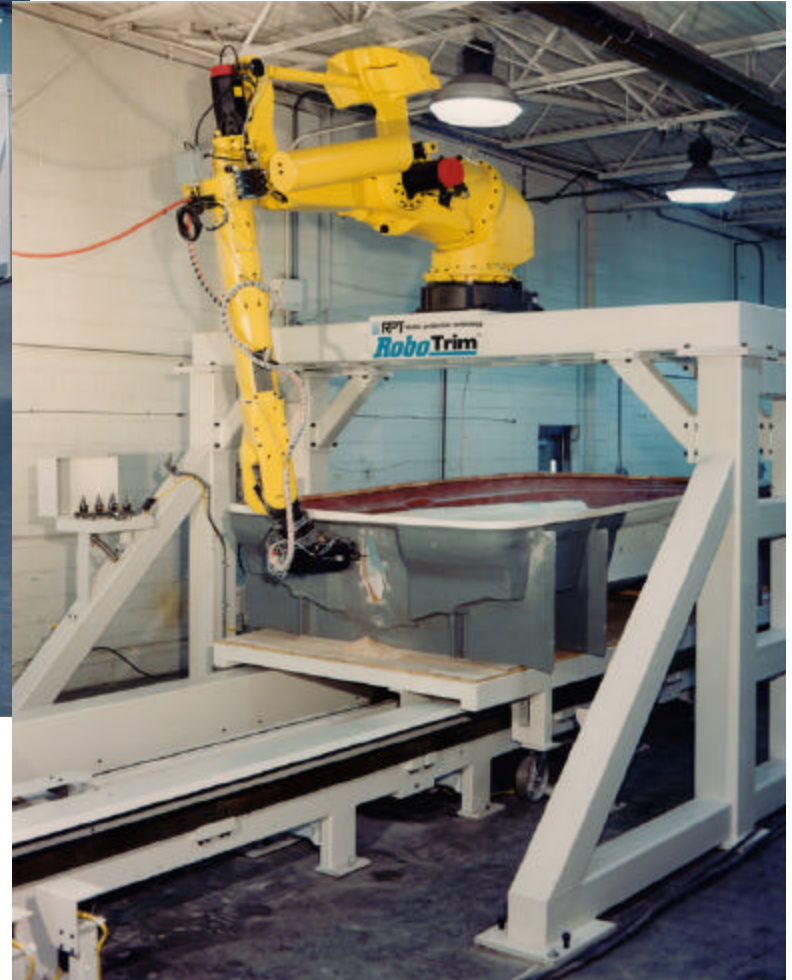


Router trimming of composites



Windows Media Audio/
Video file

Video



Router trimming of composite door panel

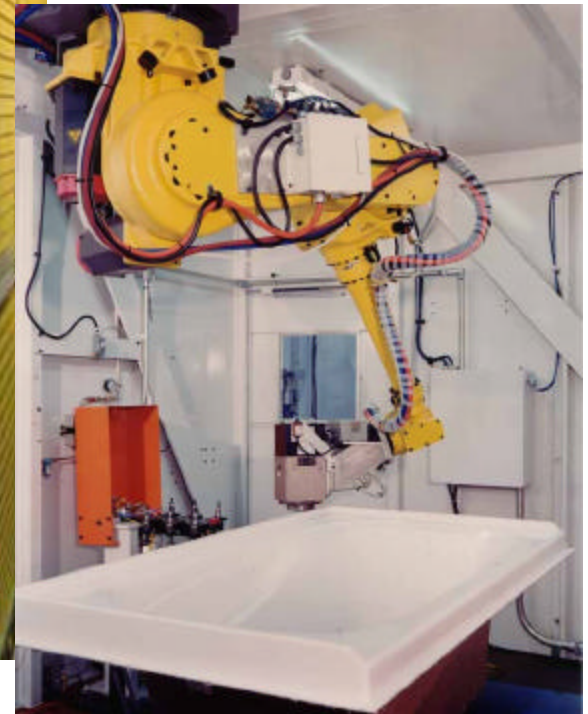


Router trimming of composites



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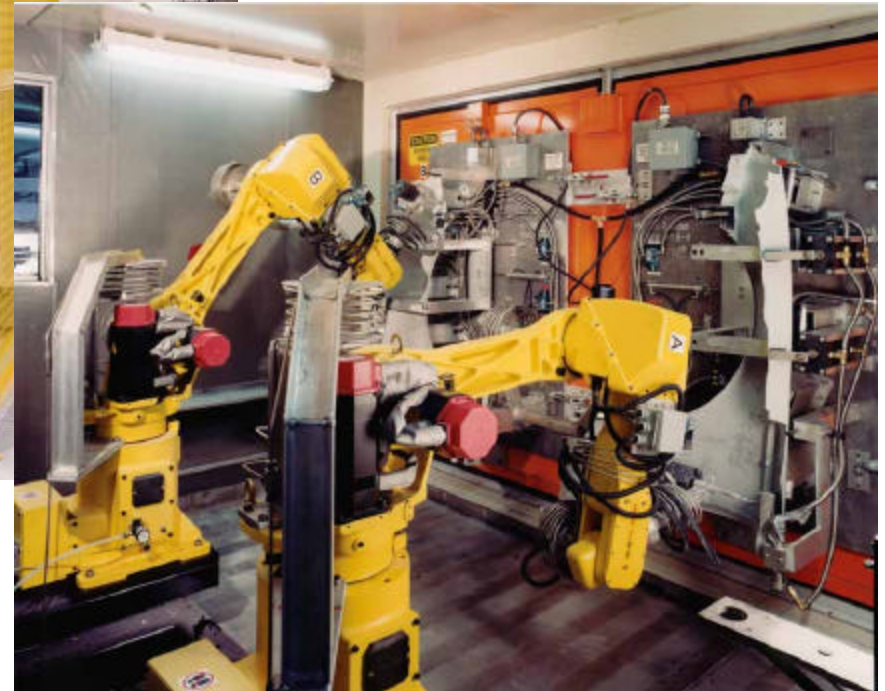
Video



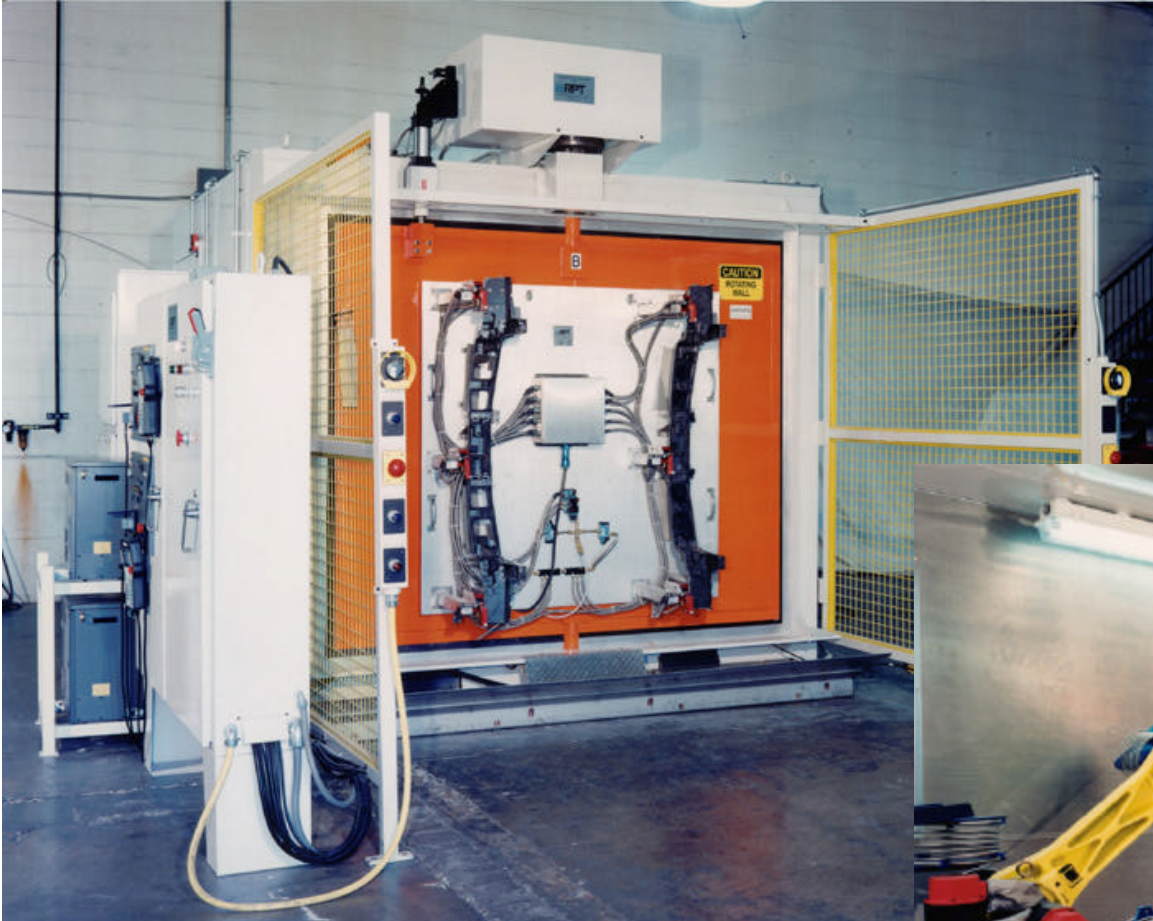
Water jet cutting of composite truck parts



Water jet cutting of composite parts



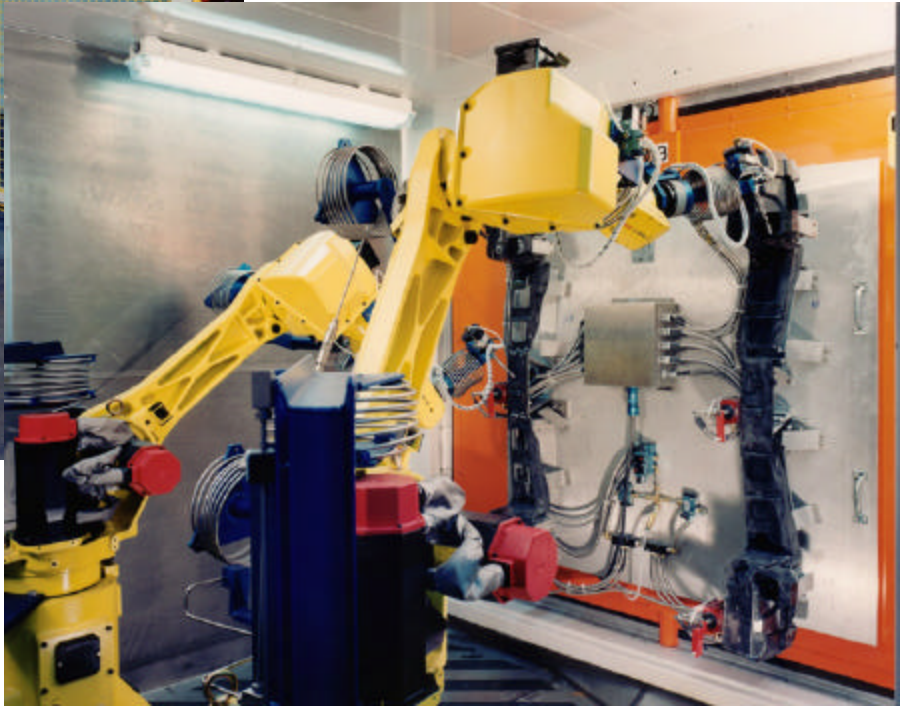
Water jet cutting of bumper reinforcements



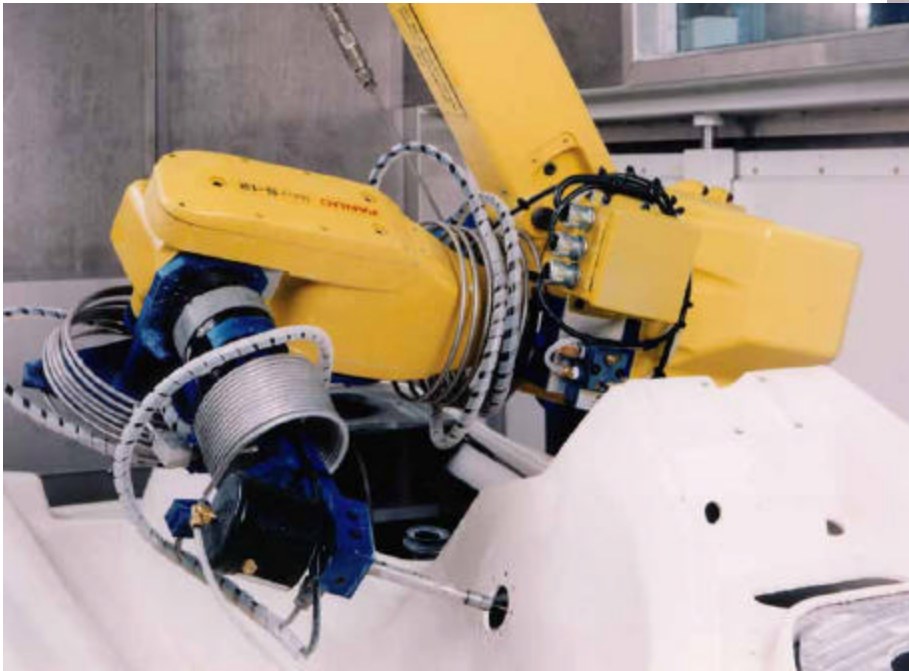
Video



Windows Media Audio/
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Water jet cutting of marine craft

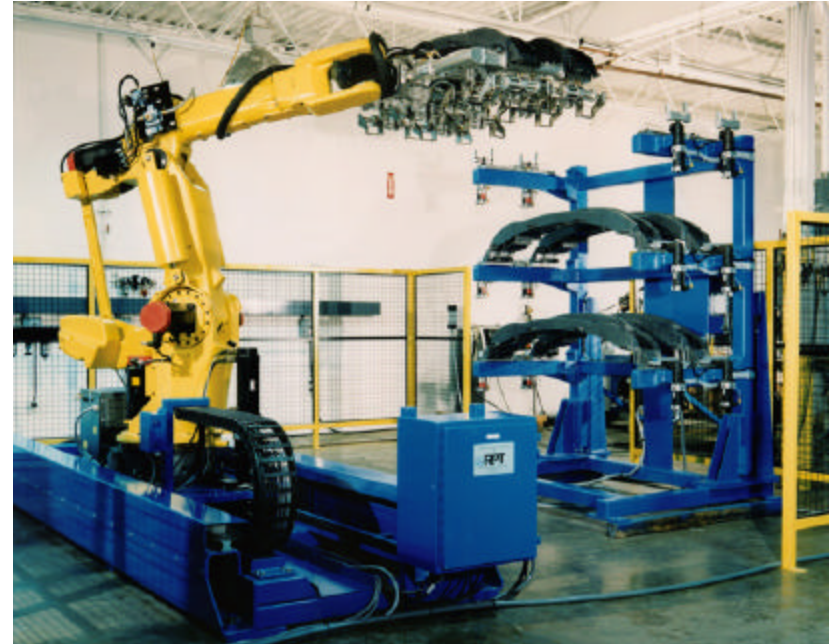


Water jet cutting of composites

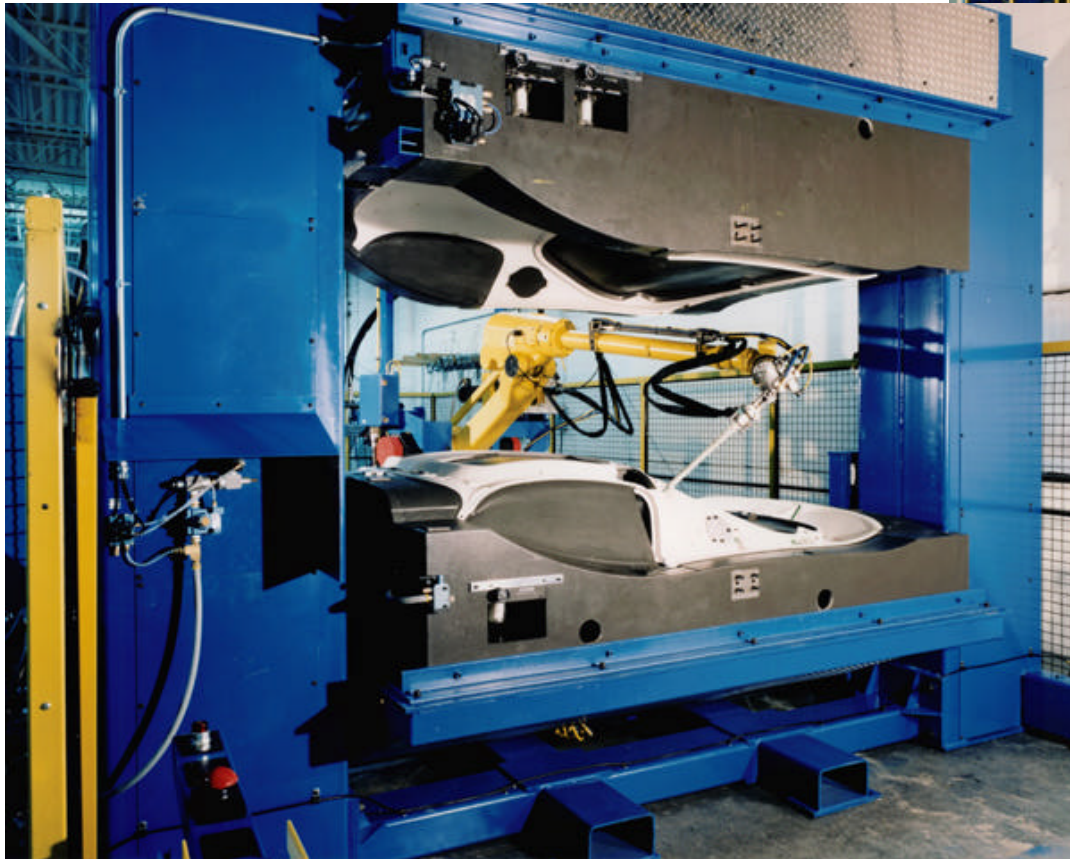


Material handling

- **By using robotics to handle composite parts, damage to parts can be minimized or eliminated.**

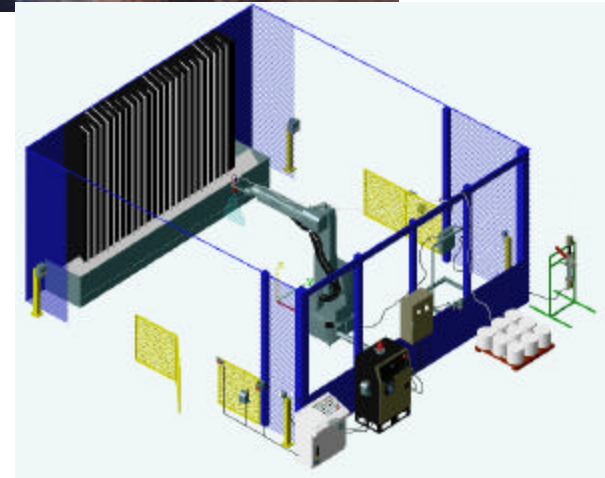


Dispensing



Fiberglass chop & gel application

- Spray chop and gel to composite truck bed liners that replace sheet metal or aftermarket bed liners
- Truck cabs



Case Study: Tier One Automotive Supplier

Problem

- **Plastics division makes SMC (Sheet Molded Composite) doors, hoods, and lift gates, as well as engine components, pickup truck boxes, and other parts.**
- **Many of the components require slots, holes and other details for assembly purposes.**



Case Study: Tier One Automotive Supplier

- **To finish the parts, the company used multiple drill fixtures, punches and dedicated hard tooling to drill holes, processes that were geared toward high volume production, and not as suitable for shorter runs (for lower volume specialty vehicle programs).**
 - **Trim presses, for instance, were relatively inflexible and required lengthy changeovers.**
 - **With new product introductions occurring at an accelerated pace, engineers were looking for ways to finish parts without the need for entirely new tooling.**
-

Problem

- **In addition, edge quality was effected by wear factors on the mechanical trim dies, due to the concentrated amounts of abrasive glass found in SMC.**
 - **The tooling took up considerable floor space and was maintenance-intensive.**
 - **Reliability concerns were raised by previous 5-axis CNC router and water jet systems which they had utilized in the past.**
 - **Water jet cutting was considered as a high-potential process for achieving further efficiency improvements.**
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System objectives

Three main objectives

- **Flexibility - fast changeover for batch processing to meet numerous low-volume project needs, and also allow rapid implementation of new programs**
- **Decrease cycle times for greater throughput**
- **Increase quality levels by assuring high repeatability of tight tolerances. System needed to address dust control and factory footprint issues.**



System configuration

- Pre-engineered turnkey enclosed robotic water jet cutting system
- RW-12 rotating wall with acoustical sound panels
- Dual M-710i FANUC robots
- Water jet intensifier
- Tools
- Controls
- Custom operator interface
- Quick changeover with simplified tools and an integrated assist device for fixture change



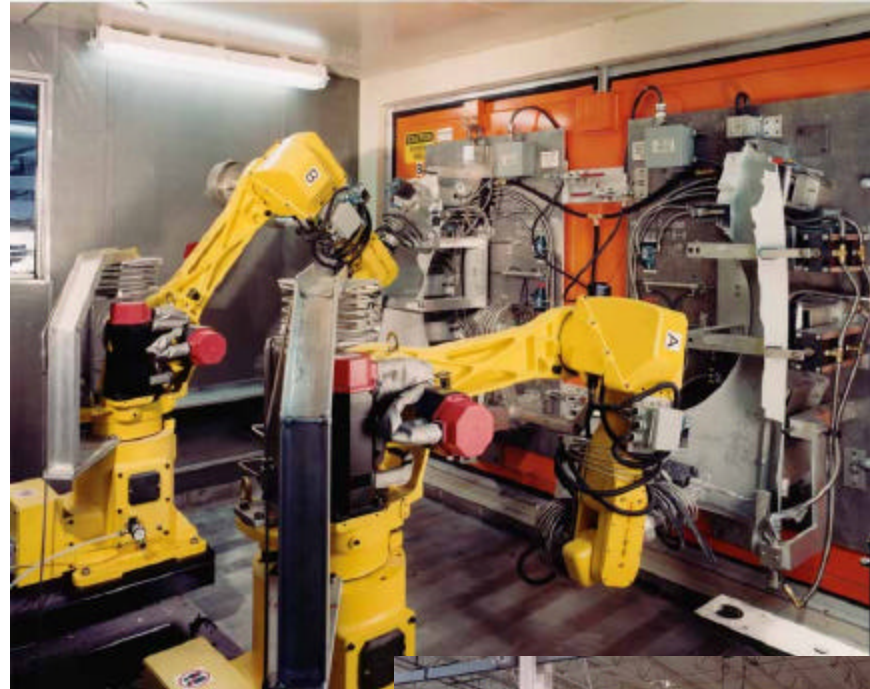
System configuration

- **Software enhancements**
 - Includes an automatic tool center point feature called TCPMate that automatically corrects for a bent tool without the inaccuracies introduced by other methods requiring manual intervention.
 - Enhanced system software and hardware held the tight tolerances of the specific cut features. Included specific shape-generation software.
- **Flexible robotic system replaces dedicated hard tooling**



System advantages

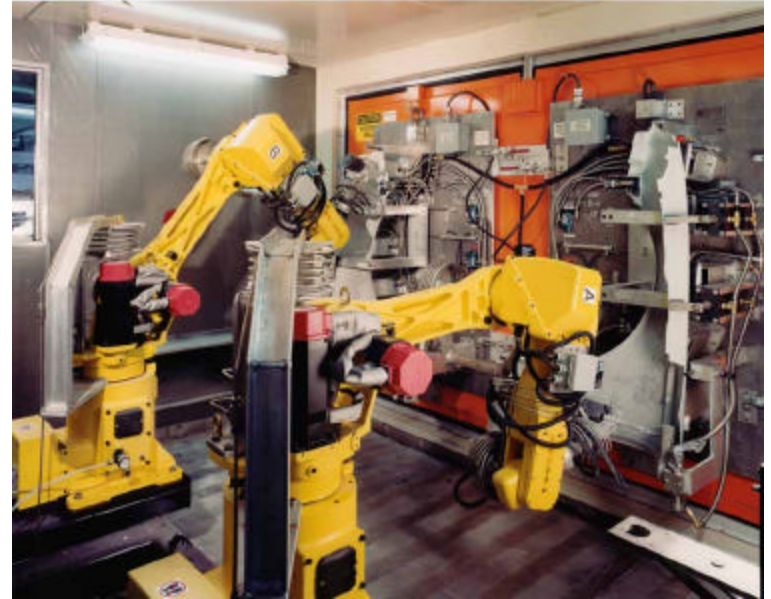
- **Easy creation and adjustment of shapes and paths**
- **High finish quality**
- **Speed of operation**
- **Available in a turnkey package**
 - Robot
 - Water jet intensifier
 - Controls
 - Tools
 - Part fixturing equipment specific to the application



The results

The system --

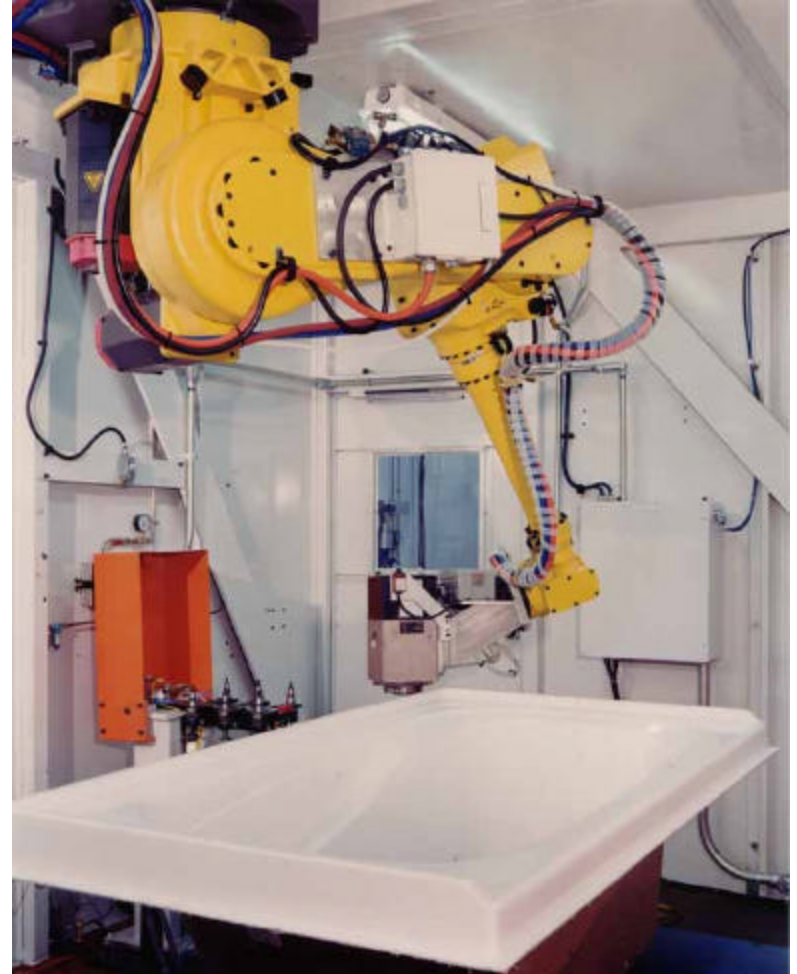
- Produced parts at a consistently superior quality level right from the beginning
- Exceeded cycle time goals
- Eliminated dust
- Lowered sound levels
- Networked with CAD systems upstream of the process, and inspection functions (via a CMM) downstream
- Enhanced response time and quality control
- Training enabled the system to get up and running quickly



Case Study: Jason International

Problem

- Working with fiberglass to make whirlpool tubs is a detail-oriented process that had numerous hand-finishing operations
- Reject rates due to human error were high
- Diverse product line includes 50 tub configurations with a total of 160 individual manual trimming and finishing operations.

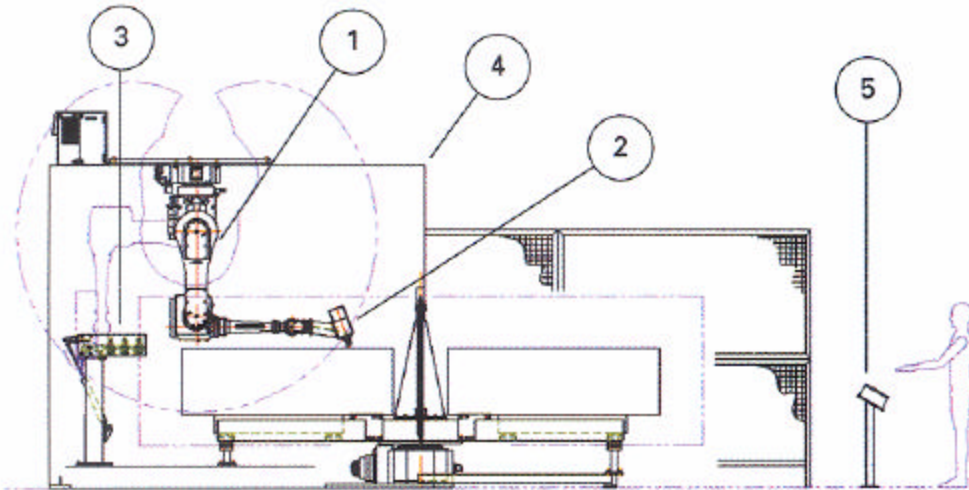


Objectives of the router trimming cell

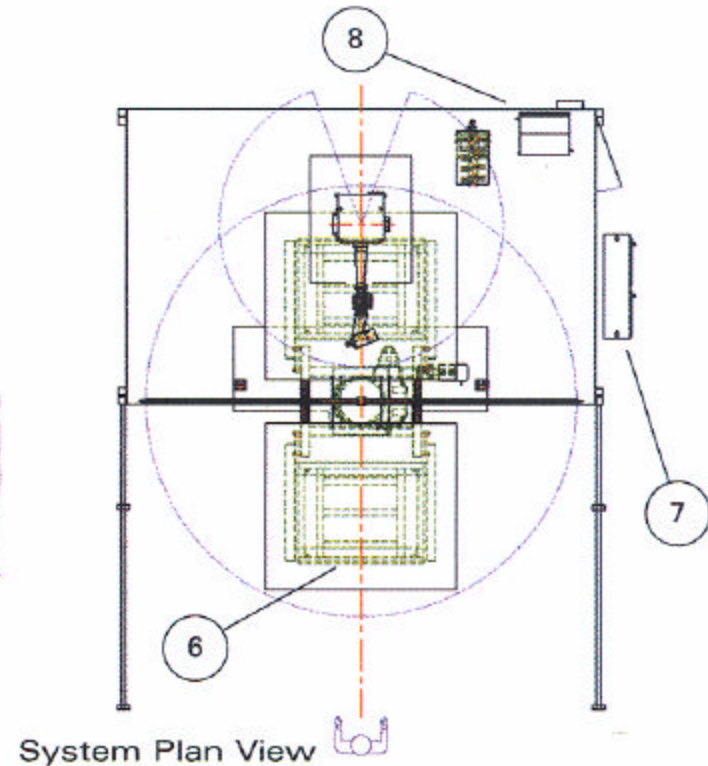
- Robotic router trimming cell would help streamline the tub trimming process
- Increase quality control
- Lower the reject rate
- Achieve random processing
- Provide a more flexible production flow via automated part recognition



System configuration



System Elevation View



System Plan View

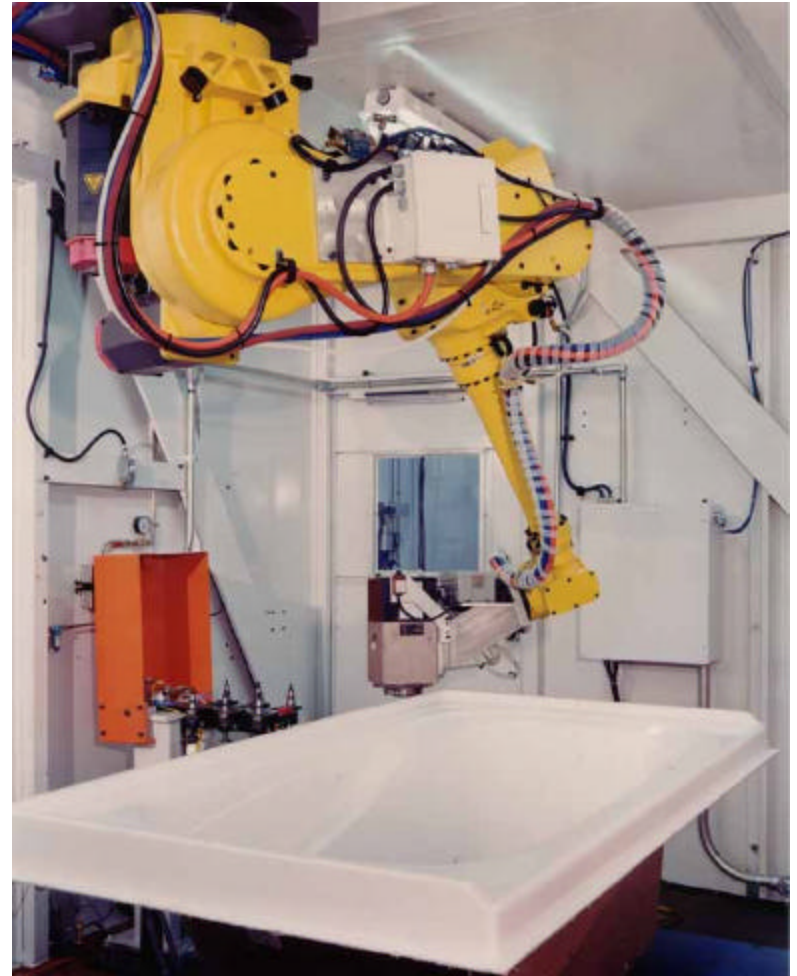
- 1 M710i FANUC robot**
- 2 Compact routing package with automatic tool change**
- 3 Tool change stand, (7) different router bits and (1) 6" diameter saw**
- 4 Sealed enclosure with 14" rotating wall**
- 5 Operator pendant and control station**
- 6 Rotating part fixture**
- 7 System control panel**
- 8 Enclosure ventilation system**

System configuration

- **Pre-engineered, turnkey system**
 - **Includes robot, fabricated enclosure, end-of-arm tooling and high-speed indexer**
 - **Replaces labor-intensive, high-reject manual finishing of showers, baths and hot tubs with high-throughput, high repeatability robotic operations.**
 - **The rotating wall with integral enclosure allows parts to be fixtured and waiting while another is being routed or cut.**
-

Additional system components

- **Universal part holding fixture**
- **Bar coding system for recognizing part configurations to determine setup protocols and the part program**
- **Software tools -- touch sensing, accuracy enhancement products**
- **Tool changer to accommodate drills, routers and saws**



The results

200% increase in productivity

- By using flexible robotic methods to trim composite, Jason International saw a 200% increase in productivity.
- The cell reduced processing time per part significantly.
- Huge gains in part-to-part finishing accuracy and repeatability.



The results

What did the customer think?

“This cell has made us stronger as a company,” said DeWayne Coats, industrial engineer, Jason International.

ROBOTICS

Robotic Routing Cell Optimizes Quality, Increases Throughput 200%

In manufacturing, simplicity is the key to efficiency.

When you are in the hot tub business, simplicity is often an elusive goal. One such manufacturer, Jason International, Inc. (North Little Rock, AR), restored order from an endless list of detail work by integrating an industrial robot into their production team. The turnkey cell is a RoboTrim™ routing system, designed and assembled by robotic integrator RPT (Robotic Production Technology; Auburn Hills, MI). Jason International has experienced significant gains in speed, quality, and overall productivity.

Working with fiberglass to make whirlpool tubs is a detail-oriented process that had required numerous hand-finishing operations. Reject rates due to human error were high. Jason's diverse product line includes 50 tub configurations, necessitating a total of 160 individual trimming and finishing operations that had to be performed manually. Jason and RPT determined that a robotic routing cell could streamline the tub trimming process. The main objectives of automating the process were to increase quality control and lower the reject rate, while achieving random processing and a more flexible production flow via automated part recognition.

The cell replaces labor-intensive, high-reject manual operations, reducing processing time per part significantly. A FANUC M710i robot was selected for the job. RPT solved the part fixture problems using a universal part holding fixture that Jason developed. RPT also created a bar



An inside view of the RoboTrim routing system, showing the integrated FANUC M710i robot

The RoboTrim™ routing system, designed and built by RPT (Robotic Production Technology) replaces labor-intensive, high-reject manual finishing of hot tubs with high-throughput, highly repeatable robotic processing. The rotating wall with integral enclosure enables a hot tub to be fixtured and waiting while another is being routed.

coding system for recognizing the part configuration and determining setup protocols and the part program. Touch sensing routines detected part

Touch sensing routines detect part location variations and offset the base robot paths.

location variations and offset the base robot paths. To meet the highly diverse number of trim operations, a toolchanger was integrated to accommodate drills, routers, and saws.

The result was a 200% increase in throughput, and a huge gain in part-to-part finishing accuracy and repeatability. DeWayne Coats, industrial engineer at Jason International, hired RPT based on its reputation. "RPT has surpassed all our expectations with this robotic system because they took the

Summary

- **By modernizing their operations, many composites manufacturers have made their operations safer, more efficient and more productive.**
 - **By updating with automation, companies will see an impact on the bottom line**
 - Increased throughput
 - Improved quality
 - Reduced scrap
 - Improved safety
 - Material savings
 - **Predictability, consistency and reliability of robotic automation leads to effectively managed facilities.**
-

How to get started...

Questions to ask when choosing a robotic integrator

- Experience in automotive and composites industries?
 - Process expertise and open to evaluating which process is best?
 - Past experience in providing turnkey pre-engineered systems?
 - In-house engineering capabilities?
 - Able to compensate for inconsistencies in manufacturing of the part?
 - Full service provider?
 - Technical support available 24 hours/7 days a week?
 - Aftermarket support real time?
 - Hands-on training?
-

The automation process

