Staying Competitive in a Rapidly Changing Plastic Fabrication Environment

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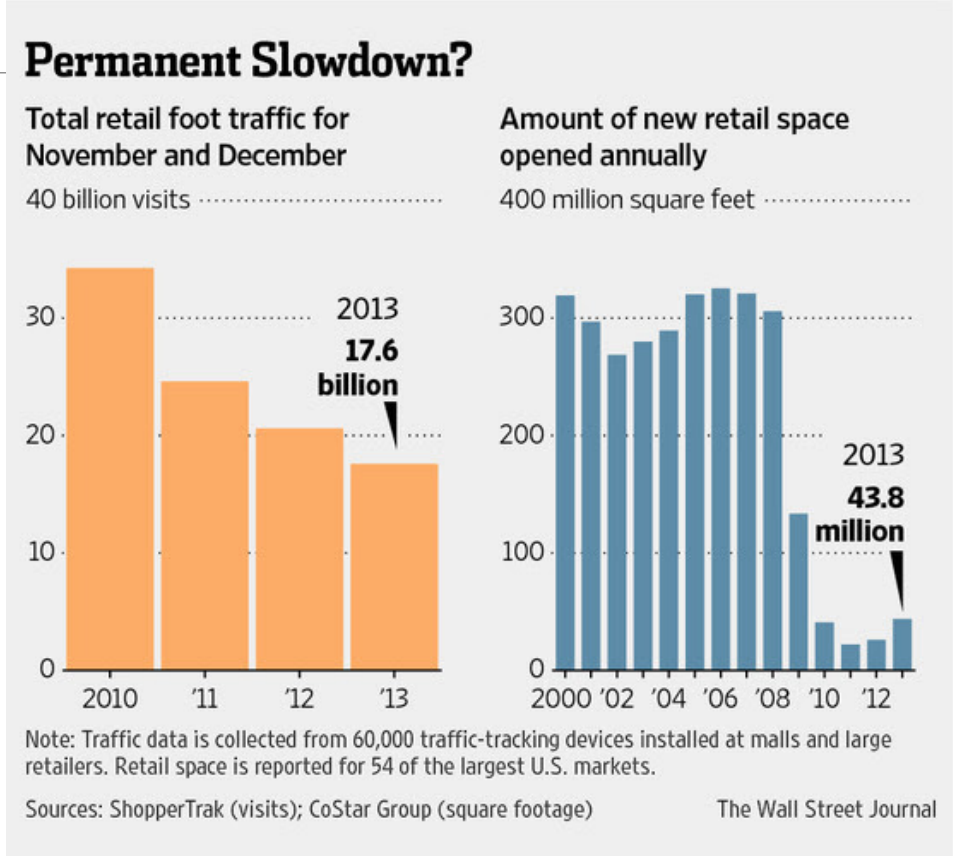
scmgroup
advanced material

Introduction

- Technological innovation is rapidly changing markets, especially POP Display and Fixture Market
- The brick and mortar retail industry has been and is in a bubble
- Companies must develop plans and strategies to identify new market segments for long term sustainability and growth



The POP Display and Fixture Market

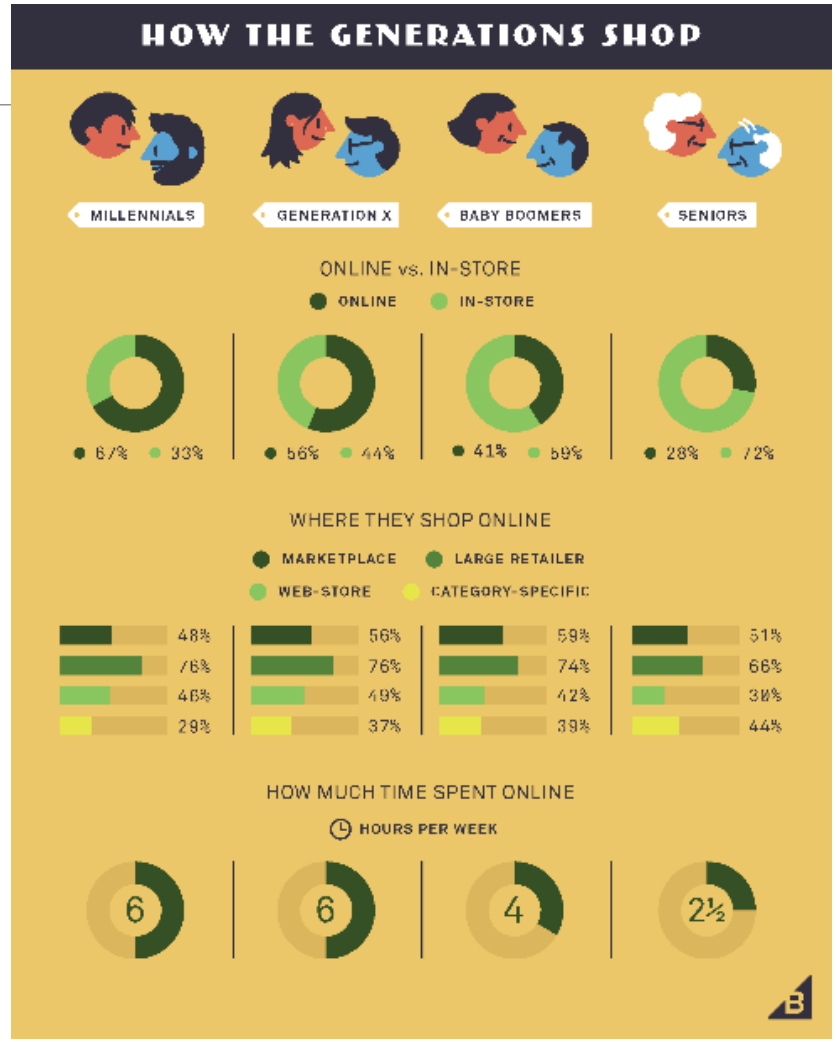
- Large retailers have a difficult time competing against online E-tailers, especially amazon.com
- The downturn is expected to continue resulting in a negative impact to the POP Display and Fixture market.
- Examples of plastic materials affected:
  - Acrylic (Plexiglas®, Lucite®, Optix®, Acrylite®)
  - Polycarbonate (Lexan™, Makrolon®)
  - Expanded Foam PVC (Sintra®, Komatex®, Celtec®

The POP Display and Fixture Market

- Major big box retail stores are disappearing.
- Store closings have already topped historical highs
- Bankruptcy filings for Q1 2017 exceeds entire year for 2016
- 2,900 store closures in Q1 2017 versus 1,200 Q1 2016
- An alarming 10,000 stores are anticipated to close this year
- . The future of both Sears and Kmart are officially in doubt
- 3,300 store openings were announced last month including 1,290 Dollar General, 650 Dollar Tree & 400 ALDI Food

The POP Display and Fixture Market

- Malls are closing at a rapid rate
- When anchor tenants leave, fewer consumers shop at the other stores in the mall
- Non anchor tenants may leave as a result
- GDP growing for 8 straight years
- So what the heck is going on?
- Many stores will survive however the rise of e-commerce not only moves sales online but also builds new consumer shopping habits



The POP Display and Fixture Market

- Opportunities still exist in the POP Display and Fixture market but they will not be sufficient to offset the massive closings
- Future changes in technology and consumer behavior will further affect opportunity in a negative manner

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- Prediction! - Online shopping might be the most transformative force in retail today but self-driving cars could change retail as much as smartphones
- Currently, there are 19 companies working on driverless car technology
- This will create new retail conveniences, traffic headaches and inspire new business strategies that could take additional businesses out of shopping malls
- The future of retail could get even weirder yet

Planning for the Future

- The display market will continue to deteriorate and there will be reduced growth opportunities for those 100% dedicated to the POP Display and Fixture market
- Raising prices to offset the drop-off in business might not be an effective option
- Those who are not proactive will be left behind
- Plastic machining and fabrication for many other market segments offers opportunities for growth

Planning for the Future

The State of the Plastics Fabrication Industry

- The overall plastic fabrication industry continues to thrive and opportunities for supplying fabricated parts are excellent
- Plastic continues to replace wood and other materials in many applications
- There are more than 75 market segments in addition to the POP Display and Fixture Market
- Profit margins can be significantly higher

Planning for the Future

"Change before you have to"
- Jack Welsh

The State of the Plastics Fabrication Industry

- Fabricators who offer precision machining services can flourish
- Approaching new markets in plastics will require precision machining capability
- Machines 10 years or older are typically unsafe, inefficient, less productive and provide inferior quality
- Older machines also require higher cost of maintenance / opportunity cost
- You will not be competitive with those fabricators already invested in the newer high-end machines who are already selling within the markets you would like to penetrate.
- Some markets will require documented quality control standards

Tolerances for Plastics

- Repeatability tolerances of today's technologically advanced machines are phenomenal
- Most customer drawings have standard tolerances of +/-.005 for 3 place decimals, +/-.015 for 2 place decimals and +/-.030 or wider for fractions
- Close part tolerances are demanded by companies in certain market segments such as aerospace, semiconductor, etc.
- Holding part tolerances closer than +.005/-.005 is not recommended and will lead to customer rejects
- Exceptions should be noted in writing and confirmed with the customer during the proposal stage even though the machine's repeatability tolerances are within .004 or less

Planning for the Future

Key areas to address

- The market(s) that you choose
- Manufacturing processes
- People needs
- **Equipment and automation**

Machines used to process Plastics / Advanced Materials

- CNC Routers
  - 3 Axis
  - 4 Axis
  - 5 Axis
- CNC Panel Saws
- Material Handling, Robots
- CNC Mills & Lathes
- CNC Laser
- Tenoners / Moulders
- Sanders/Planers
- Diamond Edge Polishers
- Other

Making a Purchasing Decision

- 65+ CNC router manufacturers and 15+ CNC panel saw manufacturers
- How do you select the right machine?
- Thoroughly research the company before you invest
- Seek referrals and see a demonstration using your drawings and materials
- Make a detailed comparison spreadsheet (hand outs)

Making a Purchasing Decision

- Penetrating new market segments will require flexible CNC machines
- Must be able to machine parts from all types of plastic materials
- Examples of some of the more popular and difficult thermoplastic, thermoset, composite plastic and soft metal materials to machine are:
  - Acetal (Delrin®)
  - Glass Based Laminates
  - PETG
  - HDU Polyurethane
  - PVC
  - Nylon
  - Phenolics
  - UHMW
  - Composite Filled Materials
  - PEEK
  - Polypropylene
  - Aluminum

Making a Purchasing Decision – Other Considerations

- Part and Sheet size capability
- Edge Finish and accuracy capability
- Pendulum and nesting capability
- Productivity, set up & cycle time requirement
- Ease of use
- Training Support by Vendor – pre and post install
- After Sale Support & Service
- Safety Features

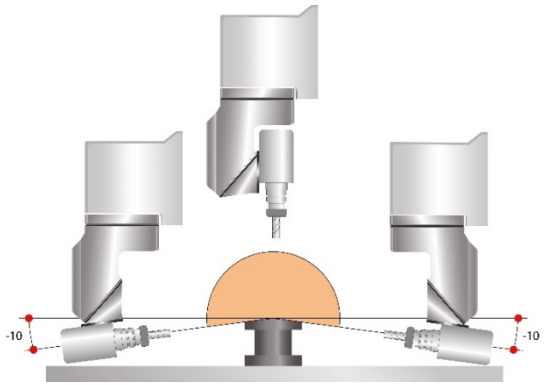
CNC Routers– Key Considerations for Machining Plastics

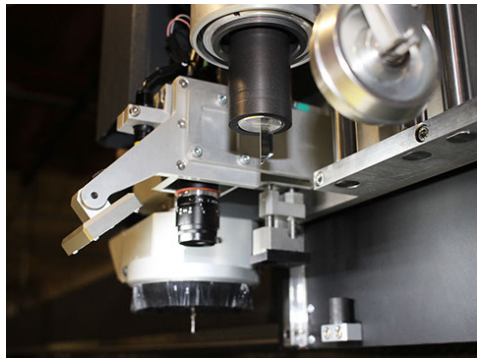
- Capability
- Accuracy/Repeatability
- Edge Quality
- Material Yield
- Productivity
- Safety

CNC Routers– Key Considerations for Machining Plastics

❖ Capability – What Markets and Products?

- Number of Spindles/Heads
- 3/4/5 Axis
- Working Z Height
- RPM range
- Special Attachments

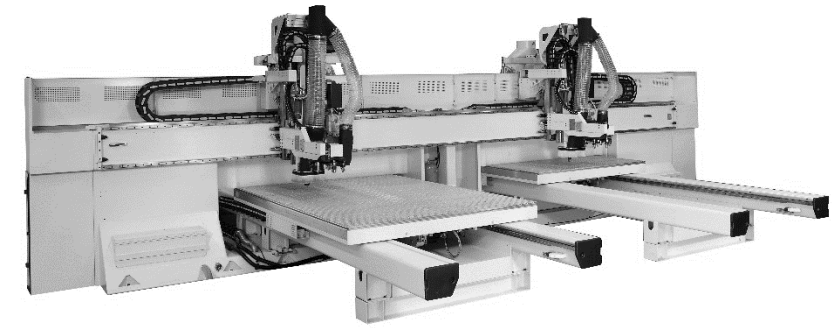




CNC Routers– Key Considerations for Machining Plastics

❖ Capability – What Markets and Products?

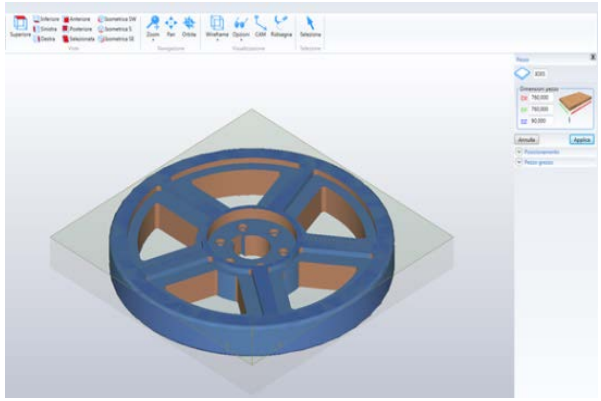
- Vacuum Table Type
- Vacuum Table Size
- Vacuum System

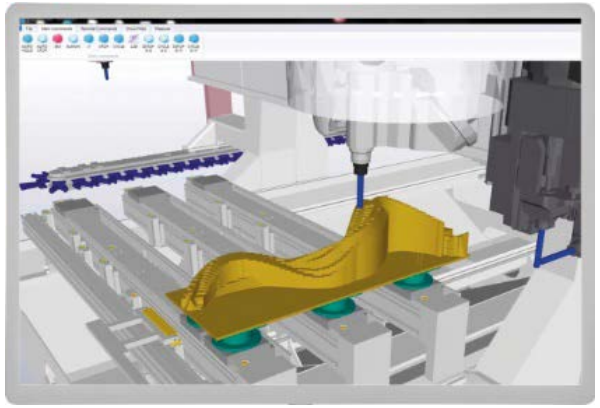


CNC Routers – Key Considerations for Machining Plastics

❖ Capability – What Markets and Products?

- Software / Number Seats
- Operator Interface
- Real time simulation

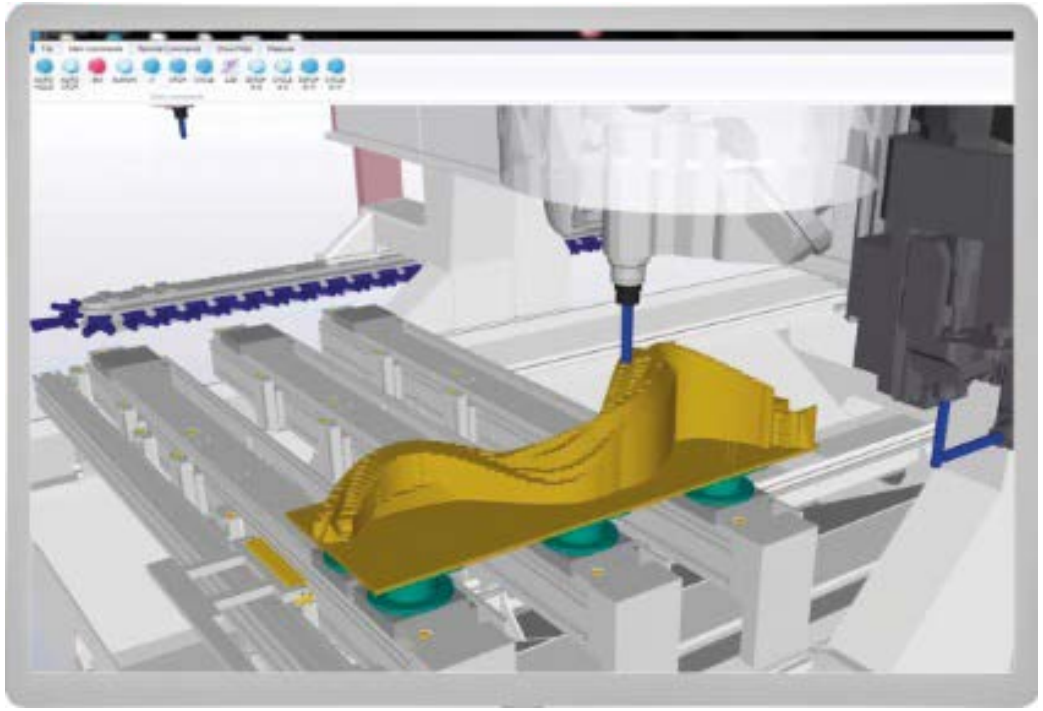




CNC Routers– Key Considerations for Machining Plastics

- Capability – What Markets and Products?

  - Real time simulation



CNC Routers– Key Considerations for Machining Plastics

- Accuracy/Repeatability
  - Base Construction
  - Drive Systems
  - Control Systems / Compensation

CNC Routers– Key Considerations for Machining Plastics

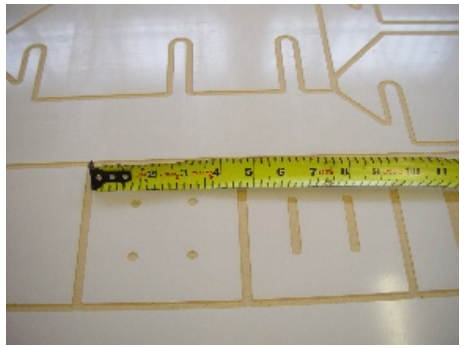
❖ Edge Quality

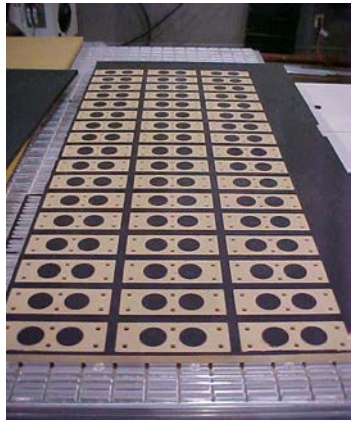
- Effective Vacuum Hold
- Ability to hold small parts

  - Onion Skinning

  - Tabbing

  - Fixtures

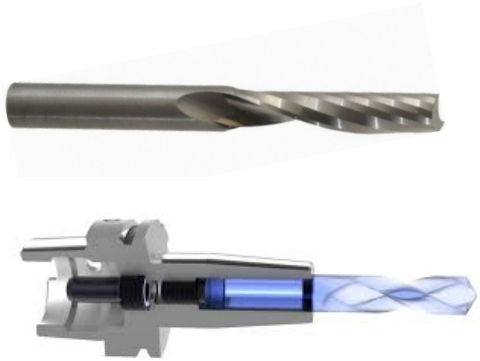




CNC Routers– Key Considerations for Machining Plastics

❖ Edge Quality

- Proper Tooling
- Feeds / Speeds
- Minimizing vibration



LMT Onsrud LP

Speed and Feeds For Hard Plastics

HARD PLASTIC	TYPICAL RPM RANGES	TYPICAL CHIP LOADS	REC. TOOL SERIES
Examples: Cast Acrylic, Rigid PVC, Plexi, Polycarbonate, Nylon, Solid Surface	**Small shapes or short cuts:** 6000 - 8000 rpm **Medium shapes or medium cuts:** 10000 - 14000 rpm **Large shape or long cuts:** 16000 - 18000 rpm	**1/8 dia. tools:** .003" - .005" **3/16 dia. tools:** .005" - .007" **1/4 dia. tools:** .007" - .009" **3/8 dia. tools:** .008 - .010" **1/2 dia. tools:** .010 - .012"	**63-700 series** - single flute upcut **62-700 series** - single flute downcut **52-600 series** - double flute upcut **57-600 series** - double flute downcut **56-000P series** - double flute straight

FEED RATE = CHIP LOAD X NUMBER OF FLUTES X RPM

EXAMPLES OF SPEEDS & FEEDS DEPENDING ON SHAPE AND SIZE OF MATERIAL

Small shapes or short cuts		Medium shapes or medium cuts		Large shape or long cuts	
Single flute tool	Double flute tool	Single flute tool	Double flute tool	Single flute tool	Double flute tool
1/8 tool - 6000 rpm, 18 - 30 ipm	1/8 tool - 6000 rpm, 36 - 60 ipm	1/8 tool - 12000 rpm, 36 - 60 ipm	1/8 tool - 12000 rpm, 72 - 120 ipm	1/8 tool - 18000 rpm, 54 - 90 ipm	1/8 tool - 18000 rpm, 108 - 180 ipm
1/4 tool - 6000 rpm, 42 - 54 ipm	1/4 tool - 6000 rpm, 84 - 108 ipm	1/4 tool - 12000 rpm, 84 - 108 ipm	1/4 tool - 12000 rpm, 168 - 216 ipm	1/4 tool - 18000 rpm, 126 - 162 ipm	1/4 tool - 18000 rpm, 252 - 324 ipm
3/8 tool - 6000 rpm, 48 - 60 ipm	3/8 tool - 6000 rpm, 96 - 120 ipm	3/8 tool - 12000 rpm, 96 - 120 ipm	3/8 tool - 12000 rpm, 192 - 240 ipm	3/8 tool - 18000 rpm, 144 - 180 ipm	3/8 tool - 18000 rpm, 288 - 360 ipm
1/2 tool - 6000 rpm, 60 - 72 ipm	1/2 tool - 6000 rpm, 120 - 144 ipm	1/2 tool - 12000 rpm, 120 - 144 ipm	1/2 tool - 12000 rpm, 240 - 288 ipm	1/2 tool - 18000 rpm, 180 - 216 ipm	1/2 tool - 18000 rpm, 360 - 432 ipm

CNC Routers– Key Considerations for Machining Plastics

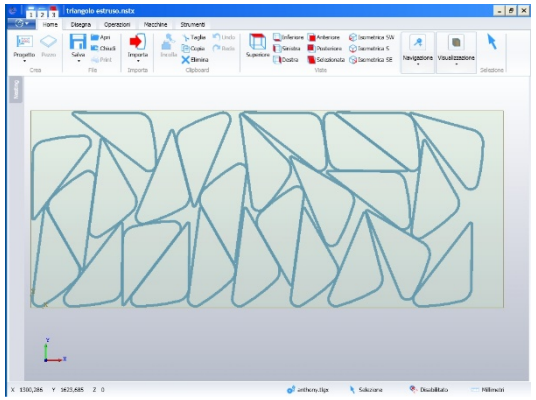
❖ Edge Quality

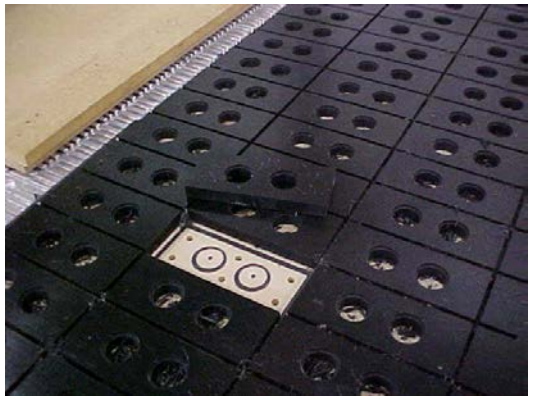
- Chip Evacuation
- Static Reduction

CNC Routers– Key Considerations for Machining Plastics

❖ Material Yield

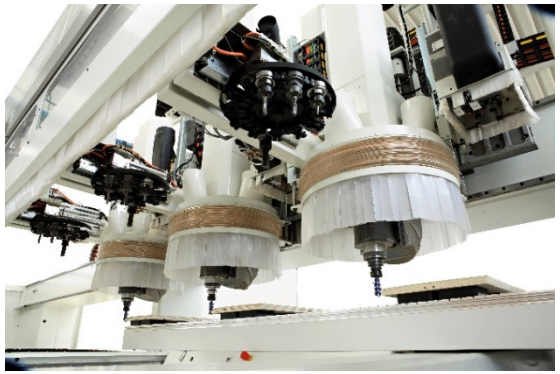
- Sawing/machining versus nesting
- Nesting Software
- Table capability for many different size sheets
- Effective Hold down





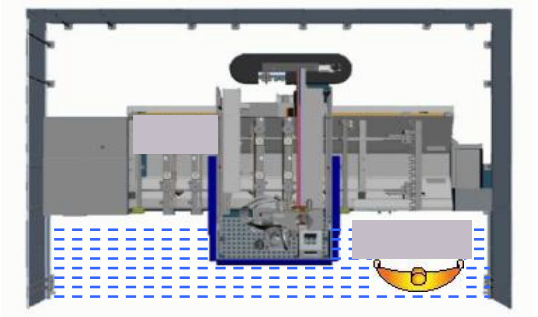
CNC Routers– Key Considerations for Machining Plastics

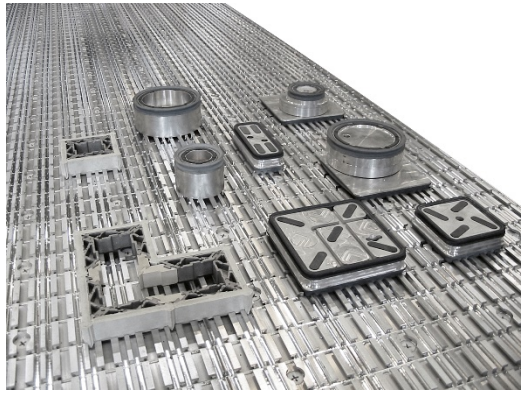
- Productivity
  - Number of heads
  - Tool changer



CNC Routers– Key Considerations for Machining Plastics

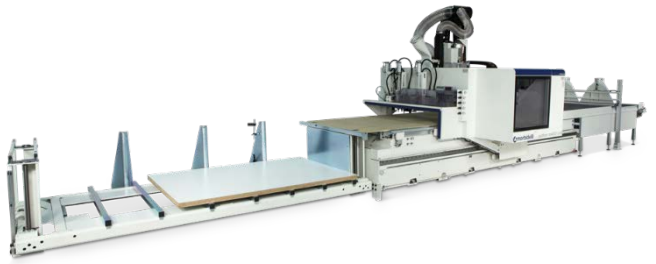
- Productivity
  - Pendulum capability
  - Quick set up times

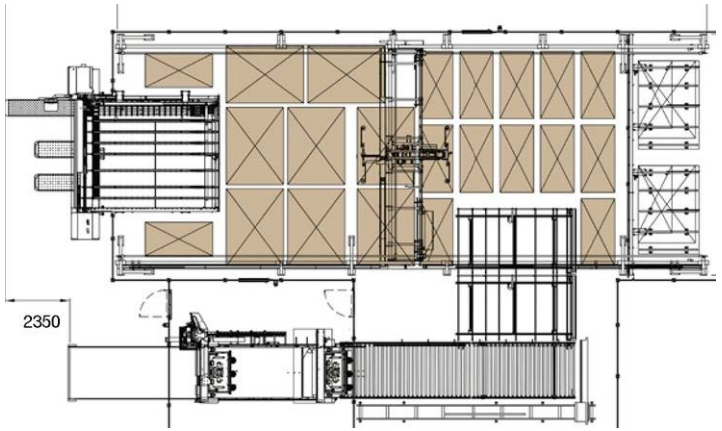




CNC Routers– Key Considerations for Machining Plastics

- Productivity
  - Material Handling

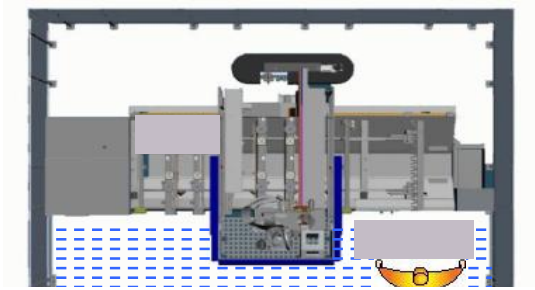




CNC Routers– Key Considerations for Machining Plastics

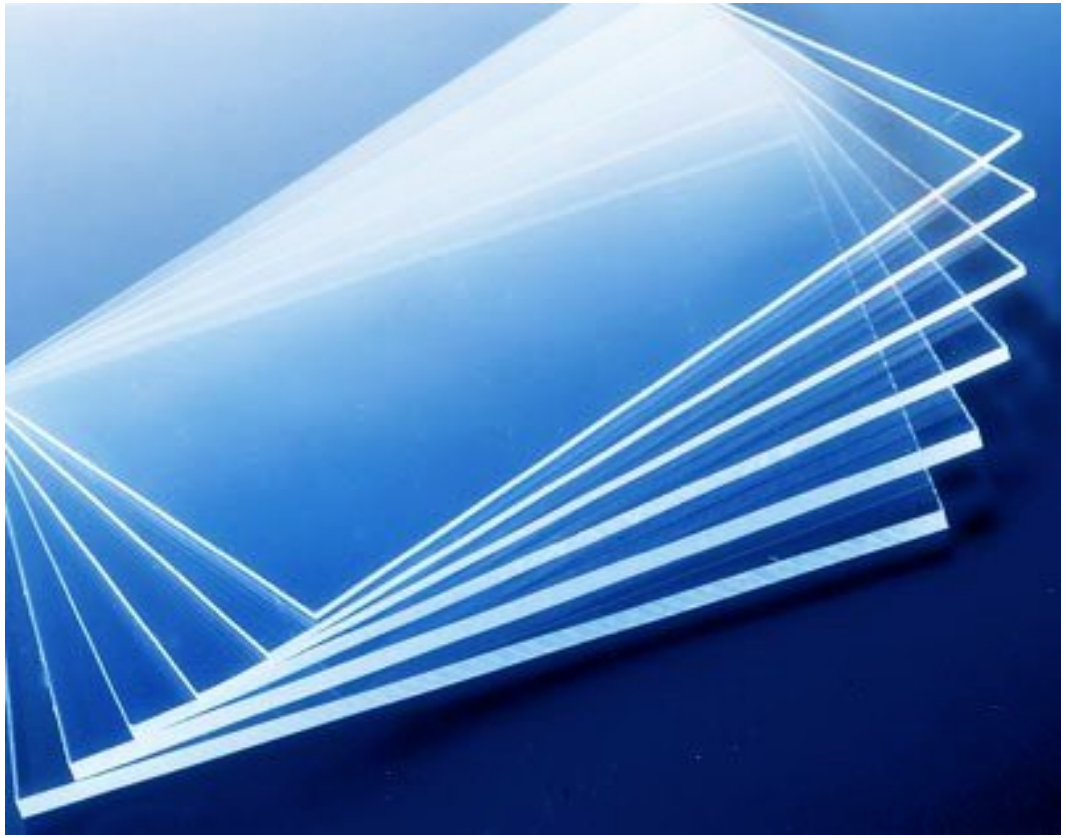
❖ Safety

- Engineered into design
- Safe Access around machine
- Spindle
  - Safety Enclosure
  - Polycarbonate Covers
  - Kevlar Flaps
  - Safety Cables
  - Stop Buttons



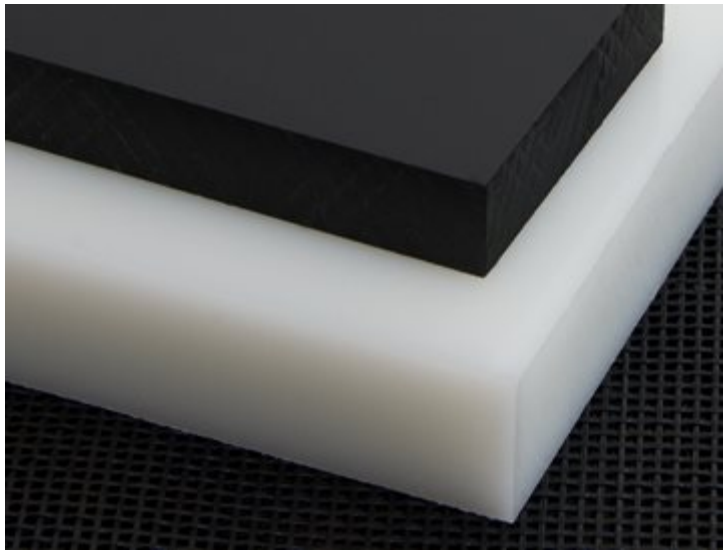
CNC Router Demonstration

Routing / Polishing Acrylic



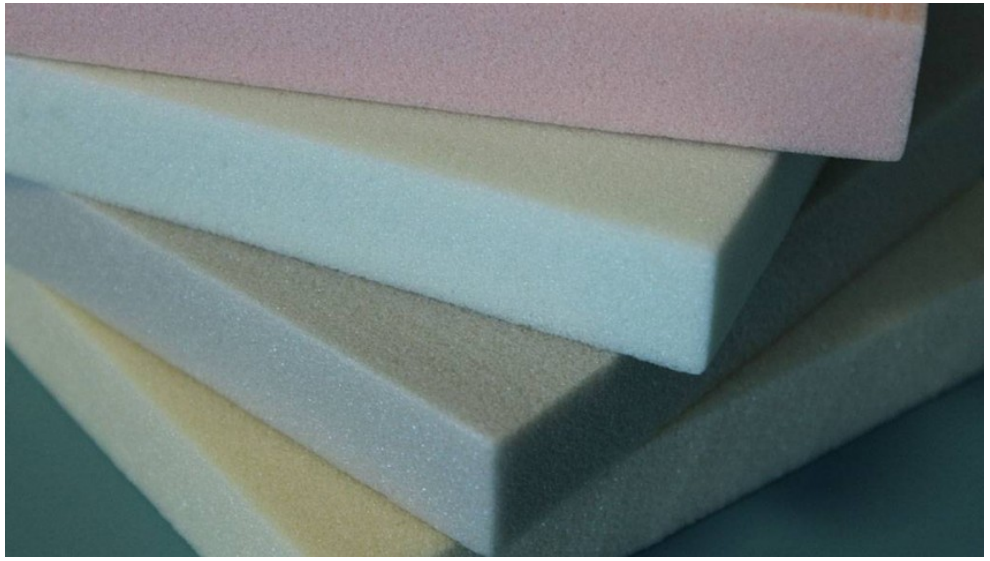
CNC Router Demonstration

Routing - HDPE



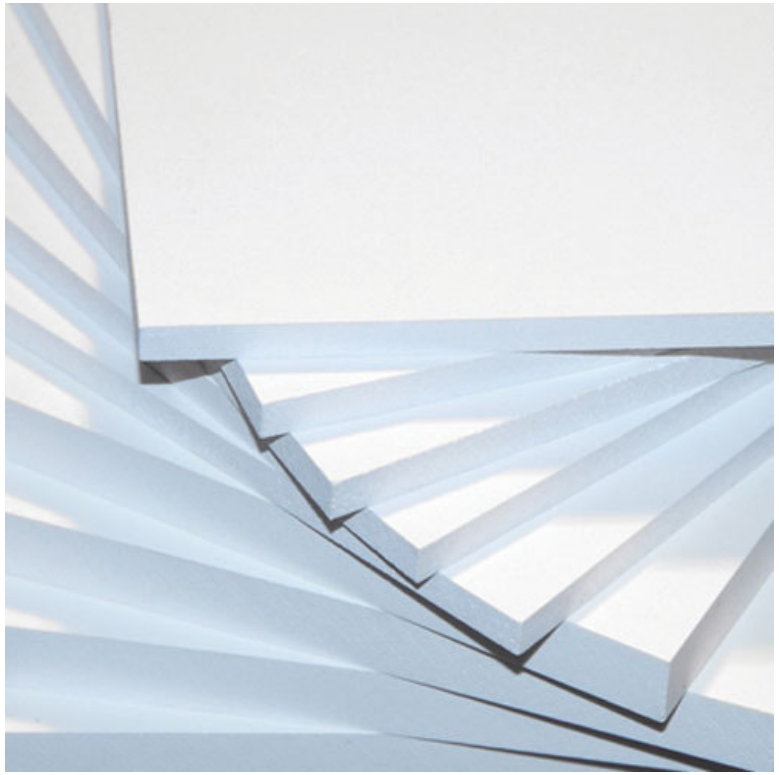
CNC Router Demonstration

Routing – HDU Polyurethane



CNC Router Demonstration

Routing Expanded Rigid Foam PVC



CNC Panel Saws – Key Considerations for Cutting Plastics

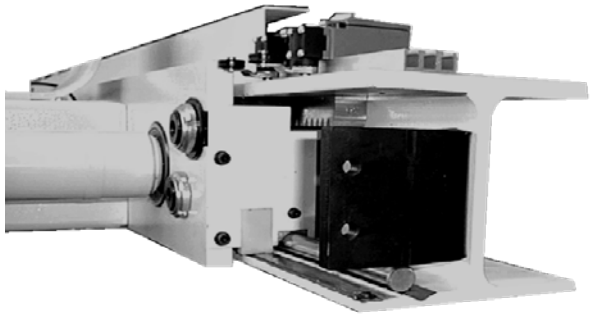
- Accuracy/Repeatability
- Edge Quality
- Material Yield
- Productivity
- Safety

CNC Panel Saws – Key Considerations for Cutting Plastics

- Accuracy/Repeatability
  - Well supported base, saw carriage, beam

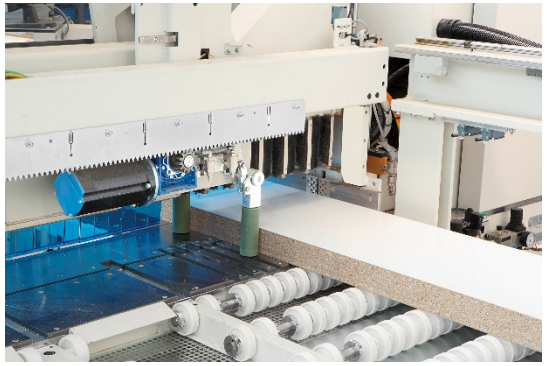
CNC Panel Saws – Key Considerations for Cutting Plastics

- Accuracy/Repeatability
  - Accurate pusher measurement



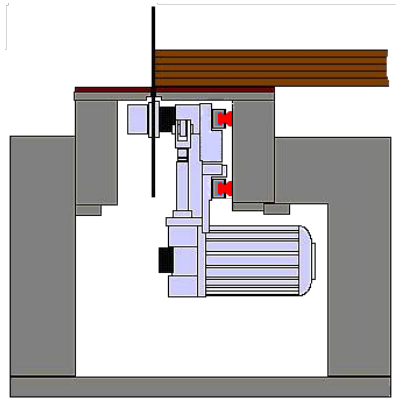
CNC Panel Saws – Key Considerations for Cutting Plastics

- Accuracy/Repeatability
  - Controlling material for complete cycle



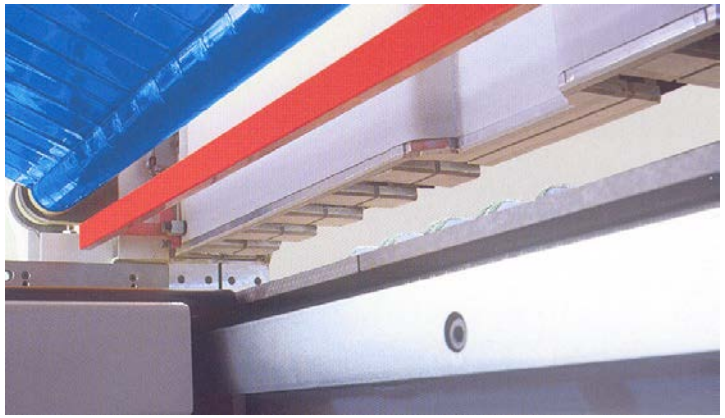
CNC Panel Saws – Key Considerations for Cutting Plastics

- Accuracy/Repeatability
  - Minimizing blade deflection



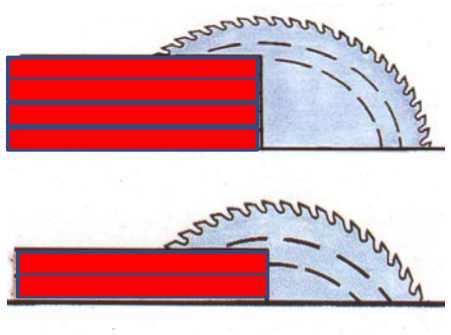
CNC Panel Saws – Key Considerations for Cutting Plastics

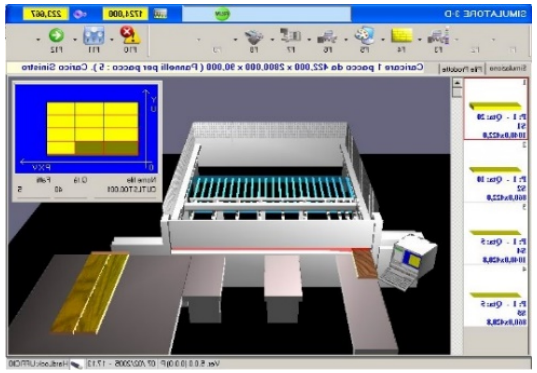
- Edge Quality – Controlling Vibration
  - Narrow openings for cutting table, pressure beam and clamps



CNC Panel Saws – Key Considerations for Cutting Plastics

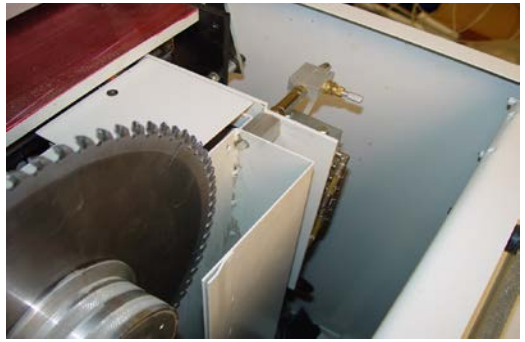
- Edge Quality – Preventing chipping and heat issues
  - Saw blade height, speed and rpm control





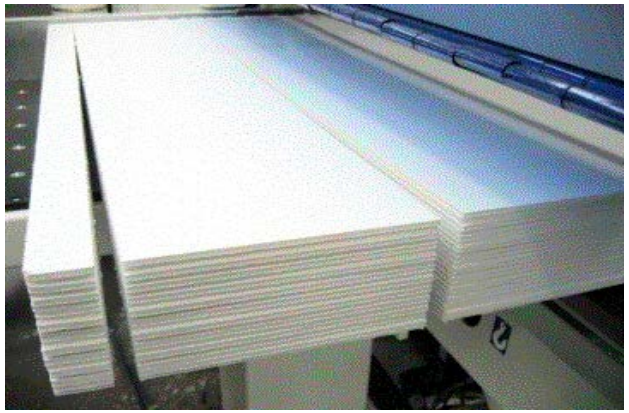
CNC Panel Saws – Key Considerations for Cutting Plastics

- Edge Quality – Preventing chipping and heat issues
  - Tooling + Feeds/Speeds
  - Reverse Cut



CNC Panel Saws – Key Considerations for Cutting Plastics

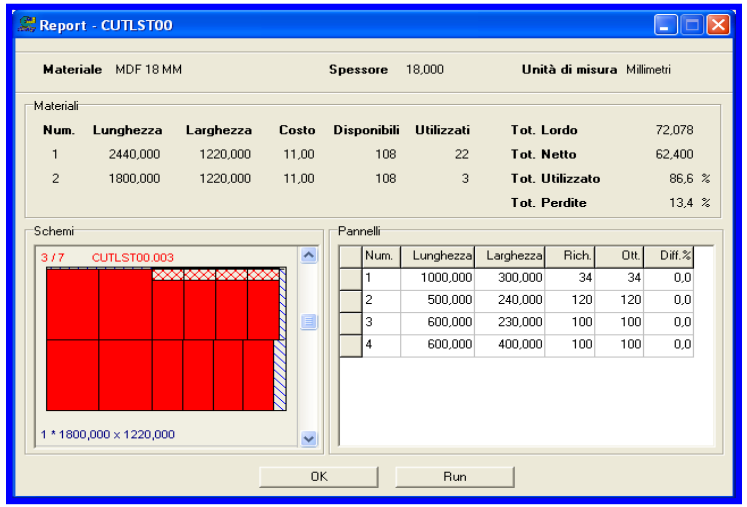
- Edge Quality – Preventing re-melt and surface damage



CNC Panel Saws – Key Considerations for Cutting Plastics

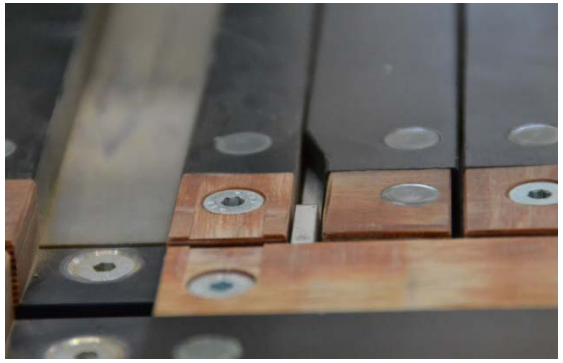
❖ Material Yield

- On board optimizer



CNC Panel Saws – Key Considerations for Cutting Plastics

- Material Yield
  - Narrow trims and cuts

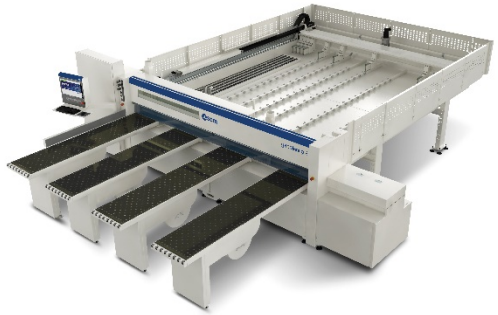


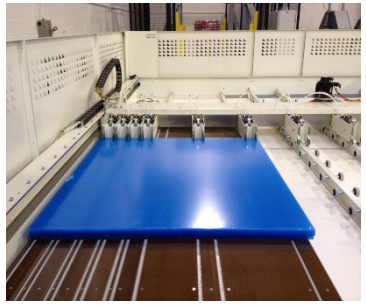
CNC Panel Saws – Key Considerations for Cutting Plastics

- Material Yield
  - Controlling material the entire cycle

CNC Panel Saws – Key Considerations for Cutting Plastics

- Productivity
  - Material Handling



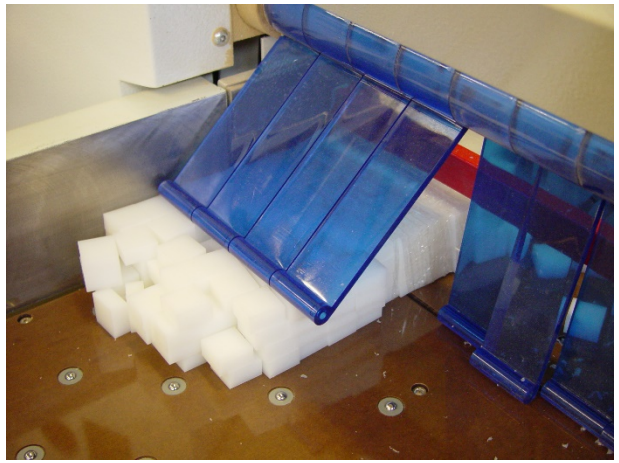


CNC Panel Saws – Key Considerations for Cutting Plastics

- Productivity
  - Quick Cycle Times / Optimized operation

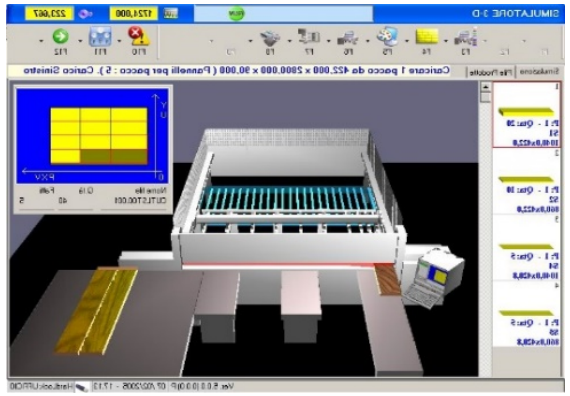
CNC Panel Saws – Key Considerations for Cutting Plastics

- Productivity
  - Ability to cut small, narrow trips and parts quickly and accurately



CNC Panel Saws – Key Considerations for Cutting Plastics

- Productivity
  - Ease of use

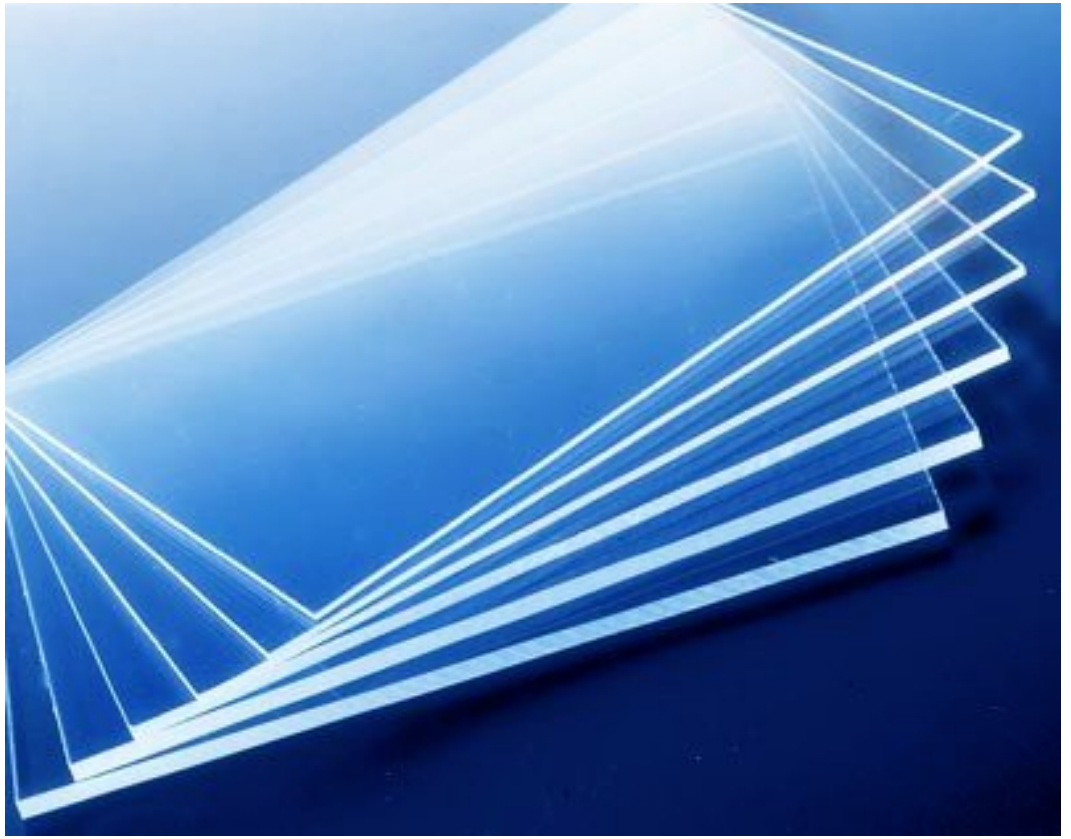


CNC Panel Saws – Key Considerations for Cutting Plastics

- Safety
  - Safety designed from ground up
  - Physical barriers
  - Emergency switches and interlocks
  - No wrench blade change

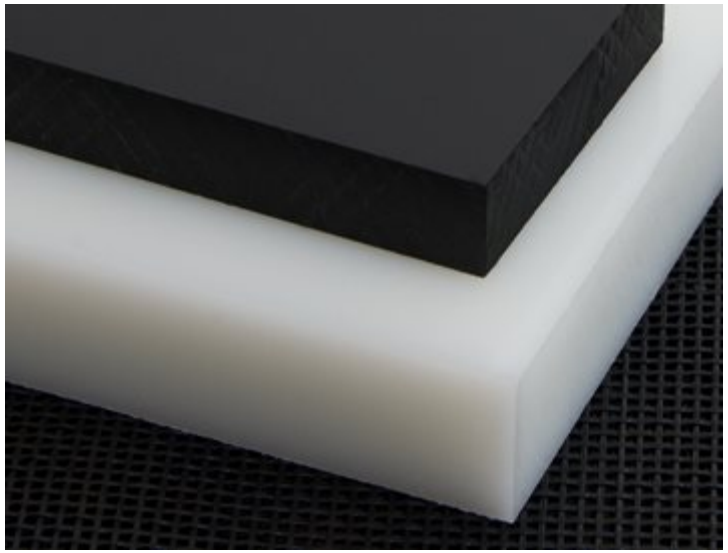
CNC Panel Saw Demonstration

Cutting Acrylic, PETG



CNC Panel Saw Demonstration

HDPE Grooving / Slotting



CNC Panel Saw Demonstration

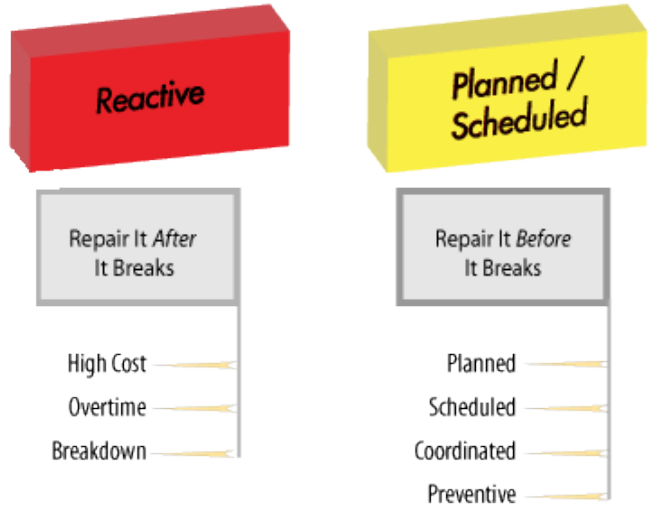
Cutting Engineered Plastics

Managing Uptime / Cost of Ownership

Preventative Maintenance

"If you don't have time to do it right, when will you have time to do it over?"
- John Wooden

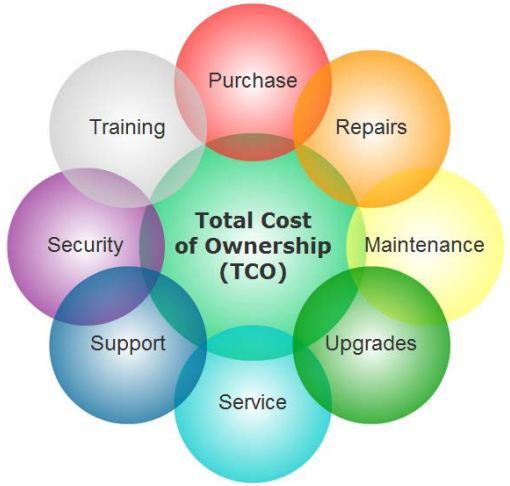
- CNC machinery represents a significant investment
- Idle/down machines do not generate income
- Downtime related to keeping the machine clean and maintained
- Plastics machining can create a significant amount of debris that must be managed
- Treat you CNC equipment like you treat your car
- Proper preventative care results in reduced cost of ownership



Managing Uptime / Cost of Ownership

Maintaining Advanced Technological CNC Equipment

- Vendor maintenance training
- Self diagnostic capability
- Machinery connected to network
- Remote diagnostics
- Advanced service capability / IoT (Internet of Things)



Yield Optimization

- Most high end machines are equipped with yield optimization software.
- In addition to calculating labor costs and overall machine cycle times, it is just as important to accurately calculate the cost of the plastic used by determining the correct number of parts and orientation on the sheet to be processed.
- Optimization software can explore thousands of solutions in just a matter of seconds, producing patterns in a fraction of the time compared to being done manually.

Quoting Guidelines

- Preparing competitive and accurate pricing when quoting is necessary for closing business and especially critical when focusing on new markets to penetrate.

- Materials used in the POP Display and Fixture markets such as acrylic, polycarbonate, expanded foam PVC and HIPS are much less expensive than materials used within other market segments. For example, acetal (commonly known as delrin®) is twice the price of acrylic and high performance engineering materials such as PEEK is more than 25 times more expensive than acrylic.

- When trying to penetrate new markets, it is recommended to analyze the quoting process and consider multiple possibilities to determine the most competitive quotation. For example:

Quoting Guidelines

- You are preparing a proposal for:
  - Material: Acetal
  - Description: Part has (4) 3” Diameter Holes with .25” radius at the corners
  - Material cost: $25.00 per sq. ft.
  - Part size: 11.75” x 11.75” x ½” thick
  - Quantity of parts: 1,000 pieces
  - Sheet size used: 48” x 120”
- Tooling used:
  - CNC Panel Saw: .173” kerf
  - CNC router: .50” diameter cutter
- Results:

Cut and rout	Router only
Saw hours: 2	Saw hours: 0
Router hours: 28	Router hours: 20
Parts per sheet: 40	Parts per sheet: 27
Material cost: $25,000	Material cost: $37,000

- Obviously cutting and routing is more competitive than routing only in this case

Leasing Example
Hourly Cost

SCM Pratix S15B	**$79,900.00 (Before Section 179)**
Monthly Payment:	**$ 1,558.85**
Weekly Payment:	**$ 389.71**
Daily Payment:	**$ 77.94**
Hourly Payment:	**$ 9.74**

Numbers based on a 40 hour work week

- Comes to work every day!
- After 5 years it's paid for or sooner

Tax Savings Section 179 Deduction

- Cash Flow Examples: (http://www.section179.org/section_179_calculator.php)
- The following illustrates the cash flow benefits and tax implications associated with the purchase and delivery of a CNC panel saw and router in 2017

	With Purchase	Without Purchase
Example 1: Net Profit	$200,000	$200,000
Equipment Purchases:	$200,000	$200,000
Section 179 Deduction:	$200,000	0
Bonus Depreciation Deduction: (50% CAP for 2017)	0	0
Normal First Year Depreciation:	0	0
First Year Write Off:	$200,000	0
Total First Year Deduction	$200,000	0
Cash Savings ($200,000 x 35% tax rate)	$70,000	0
Lowered Equipment Cost:	$130,000	0
Corporate Taxes for 2017	0	$70,000

Tax Savings Section 179 Deduction - Continued

	With Purchase	Without Purchase
Example 2: Net Profit	$500,000	$500,000
Equipment Purchases:	$500,000 (max)	$500,000
Section 179 Deduction:	$500,000	0
Bonus Depreciation Deduction: (50% CAP for 2017)	0	0
Normal First Year Depreciation:	0	0
First Year Write Off:	$500,000	0
Total First Year Deduction	$500,000	0
Cash Savings ($200,000 x 35% tax rate)	$175,000	0
Lowered Equipment Cost:	$325,000	0
Corporate Taxes for 2017	0	$175,000

Summary

- The POP Display and Fixture Market is rapidly changing
- The speed and breadth of change is increasing significantly
- Those who do not adjust will be left behind
- The Plastics fabrication market is diverse with many opportunities
- Entering new plastic markets will require investment in technology and automation
- Consider markets and capability when purchasing new equipment

Conclusion

- Thank you for participating at the “Staying Competitive in the Rapidly Changing Plastics Marketplace” presentation this morning. Hopefully, we can all meet again at a future AWFS conference to discuss and reflect on your new business accomplishments.
- Please feel free to contact me or Phil Bryant at:

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