Utilizing Current Technology To Fill the Workforce Gap

Ideas from the NTMA Manufacturing Technology Team
Better Part Routing

- Using advances in MRP system to achieve better part flow
- Family of Part Cells
- Flex Cells
- Lean Concepts
Maximize Machine Run Time

- Max Operations on Table
- Tool Probing for Breakage or Wear
- Redundant Wear Tools
- Part Probing for Size
- Max Parts on Table
- Lights Out Machining
Reducing Set-ups / Operations

- Indexers, 4 or 5 Axis
- Mill-Turns
- Max Operations on Table
- Hard Mill / Hard Turning
- Cycle time to Part ratio
Reducing Set-up Times

- Utilizing more powerful Simulation Software – CGT
- Modular Fixturing
- Photo Library of Set-ups
- Part Probing
- 5S Tools to Organize work areas
- Touch Probing
- Tool Pre-Setting
Max Operations on Table
Max Parts, Pallet Changers
Redundant Tooling
Part Probing
Tool Probing
  ◦ Tool Life Management
Robotics
Internet-Monitoring
  ◦ Control
  ◦ Video
Fixturing
To aid in lights-out manufacturing

- Vacuum Chucks
- Magnetic Chucks
- Cryogenic Chucks
- Tombstones
- Flexible Clamping System
Tool Geometry

- Take time to match Tool Geometry and Coating Technology with Material and Processes
- Use your Tool Rep to Solve Issues
Horizontal vs Vertical

Horizontal Milling Machines

- **Pros**
  - Can machine all or most of part when using a tombstone
  - Can run higher volume
  - Most are 4 axis
  - Gravity removes chips

- **Cons**
  - Smaller part size and weight
  - More expensive machine
  - More floor space
  - More complex to program
Horizontal vs Vertical

**Vertical Milling Machine**

- **Pros**
  - Larger and heavier part on table
  - Faster set up, easier to program
  - Cheaper machine
  - Take less floor space
  - More machine options and sizes

- **Cons**
  - Reduced space for operations
  - Machining from only one side
Manufacturing Systems (FMS) Pros & Cons

- Dedicated Line – Machines working as one line. (Transfers, rotary transfers)
- Linear Line – One operation per machine
- In-Line Manufacturing – Multiple machines performing same operations
- Cellular Manufacturing – Each machine performing different operations cluster together
Dedicated Line

- **Pros** – Fastest, one tool per machine, least manpower, lights out

- **Cons** – Not flexible, milling operations only, one machine down will shut-down line, complex setup

- Horizontal, vertical milling
Pros – JIT, Multi parts types, one machine down will not effect line, lights out, Horizontal or vertical mill, short runs or long runs, very flexible.

Cons – Fixed only, one piece flow.

Horizontal, vertical milling and vertical turning.
In-Line FMS

- **Pros** – More flexible, one machine down doesn’t stop production, easy machine replacement

- **Cons** – Requires more manpower, no lights out

- Horizontal, vertical milling and vertical turning.
Cellular FMS

- Pros – Multi mfg types, most flexible, smaller run sized, adjustable manpower
- Cons – More manpower, no lights out, smaller run sizes
- Most types of machines, many different types working together.
- Future – Upgradeable to robotics
Mold & Die Advances

- **Hard Milling**
  - Reduces polishing
  - Reduces cycle time

- **Newer EDM Technology**
  - Improves Surface Finishes, cycle time on both Wire & Sinker
  - Large spool on wire extends lights outs.
Underutilized Material Removal Machines

- Wire EDM
- Laser
- Water Jet
- Plasma Cutting

Use these machines to Reduce Machining Time.
  - Even a combination of the two
Wire EDM

- **Pros**
  - Use EDM to reduce Machining Operations, on small parts.
  - Runs Unmanned & Lights Out
  - Reduces Machining Stresses
  - Great for Very Small Parts
  - Extremely Accurate

- **Cons**
  - Slow process
  - Recast on older machines
  - Only Conductive materials
Water Jet

- **Pros**
  - Fast
  - Runs Unmanned & Lights Out
  - Great for large and thick parts
  - Any material

- **Cons**
  - Messy
  - Waste removal issues
  - Not for great thin material
  - Not as accurate as Wire EDM
  - Surface finish issues on thicker material
  - Kerfing without 4 or 5th axis
Laser

Pros
- Fast
- Runs Unmanned & Lights Out
- Great for large parts
- Can cut just about any material

Cons
- More costly to operate
- Fumes
- Best when cutting thinner materials
- Not as accurate as Wire EDM
- Poor surface finish
- Kerfing without 4 or 5th axis
Plasma Cutting

- **Pros**
  - Fast
  - Great for large parts

- **Cons**
  - Costly to operate
  - Fumes and dirty
  - Least accurate
  - Hardens surface
  - Kerfing without 4 or 5th axis
  - Only metals
Other Near Shape

- Purchase Pre-finished Blanks
- MIM Metal Injection Molding
- Castings
Quality Control

- Fast Non-Contact Video
- Micro CMMs / Cells
- Portable CMMs
- Empower Your Machinist
- Controllable Features
- Wireless Inspect Tools
- Build Quality into your process do not inspect quality into your process
Cool Technology

- Subzero quenching reduces stress in parts and cutting tools
- Adding Liquid Nitrogen Coolant to Hard Milling and Turning Processes Improves Speed, Surface Finish and Reduces Stress
- Nitrogen for Super-Cooling Molds reduces cycle time, improves molding output
- Cryogenic Clamping
Machine Controls

- Utilizing more of what’s in your control
- Most only use 40% of the control’s capabilities
  - High Speed milling
  - Better Tool Wear Capabilities
- Review your purchase documents,
  - Are there features that are not known.
- Contact your Distributor
  - Ask for any control software updates.
  - Have them list any inactivated feature that may be useful.
Advanced Deburring

- Water Jet
- Chemical
- Electro Chemical
- Explosive
- Extrude Hone
- Magnetic Tumbling
- Outsourcing
Your company many not be able to justify incorporating new technology.

Try Networking and/or Outsourcing to other companies or members, until you can justify your own purchase.

Use NTMA Members First for outsourcing: www.ntma.sourceauthority.com
Technology Employee Retention Tool

- Updating Equipment and Employee Skills
- Updating Industry Image:
  - From Machine Shop to Manufacturing Technology Center
- Using Healthier Vegetable Based oils
- Adding Air Cleaners, Conditioners
- Increasing the Lighting

Incorporate a 6S lean Housekeeping Program
Sort, Set-in-order, Shine, Standardize, Sustain, Safety
Technology Training

- Use your machine distributors
- Mentoring
- Cross Training
- Online
  - Tooling U – [www.toolingu.com](http://www.toolingu.com)
  - NIMS – [www.nims-skills.org](http://www.nims-skills.org)
Our Future Employees

- Finding future employees, we must get involved, with actives which can showcase our industry.
- Bots IQ – www.battlebotsiq.com
- US First – www.usfirst.org
- Cannon of Fredon – www.fredon.com
- Visit Schools, Student plant tours
Summary;
Utilizing Current Technology To Fill the Workforce Gap

- There is a lot of simple under utilized machining technology out there, use your resources to find it.
- Challenge your employees to find a way to increase productivity.
- Consult with other companies to achieve a solution; form local networks.
- Attend trade association (NTMA) functions and learn from your peers.
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Thanks