Machining Industry Ability to Respond to Growing Aerospace Demand

Aerospace Materials Conference

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Vice President
Global Aerospace & Defense
Kennametal At A Glance

$2.4 Billion  2011 Revenues
80,000 +  Active Customers
12,000  Employees
1,700 +  Patents
40%  % Revenues From Products < 5 years
60 +  Global Countries
<4%  Largest Single Customer

... Serving Some of the World’s Largest Companies
Aerospace Industry / Concerns

**Industry:**
- Commercial Aerospace Growing at >10%
- Military Aerospace Uncertain

**Concerns:**
- Workforce Shortages?
- Domestic Raw Material Supply
- New Workpiece Technology

**Productivity Opportunities:**
- Machine Utilization
- New Tooling Technology

*Productivity Opportunities (>>30%) Will Offset Concerns*
Workforce Shortages?

U.S. Workforce

- Total Employment
- Mfg Employment

31% Mfg / Total
9%
Leading companies have **Cut Production Times and Costs by Half** . . and they will do it again…

- **Multi-tasking** machine tools
- **Nearer net shape** parts
- **Quick change** tooling
- **Improved process capability**
- **Higher metal removal rates**
- **Engineered** tooling

**A Must to Compete in Today’s Emerging Markets**
On average in-cut productivity doubles every 20 years due to grade.
Ceramic Round Milling: KIPR-KSSR

Engineering to provide an outstanding MRR and productivity in Nickel base and/or Cobalt base alloys, Stellites, Stainless Steel and PH’s Series through HSM.

An order of magnitude (10X) productivity improvement compared to carbide.
Custom Solution – Ceramic Milling

Workpiece Material: Inconel 718 – 55Rc

**CHALLENGE**
- Reduce cycle of 80 hours
- Implement ceramic milling technology

**COMPETITIVE EDGE**
- Implement custom cutter using standard Ceramic inserts
- Monobloc HSK100 adaptor

**SOLUTION**
- ϕ130 / 5” slotting cutter, Z=4
- Vc = 950m/min!
- Cycle time reduced to 12 hours

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Beyond Blast Daisy – Copy Mills

Standard Program D1=63–200mm (2.5“-8“)
Ap max=10mm

PCT Precision Coolant Technology

Integrated locking guarantees copy milling process with maximum security

Geometries available for light to rough machining of Ti

-ELF / -SGF

DAISY Beyond Blast™ provides up to 100% better tool life than standard through spindle coolant delivery @ 150 SFM.
Cycle Time Reduction: ~ 48 Hours to 16

494 Inserts per Assembly

Removing 500 lbs. of material

66% Reduction in cycle time

IMPACT STATEMENT …

• 32 hr. x $197 = $6304 (Savings/Pcs.)
• 350 pcs. X $6304 = $2,206,400 (Annual)
• 11,200 hrs. of additional capacity … !
• No need to hire or add off-shifts
• Reduce or eliminate capital spending
• Increased machine utilization
• Aids calculated TPM scheduling

Actual Tool Assembly

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# The Bottom Line…Productivity

<table>
<thead>
<tr>
<th>ATTRIBUTE</th>
<th>OLD PROCESS</th>
<th>NEW PROCESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch Size</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Max Production Rate</td>
<td>1 part/day</td>
<td>2.5 part/day</td>
</tr>
<tr>
<td>Total Flow Time</td>
<td>15.5 days</td>
<td>2 days</td>
</tr>
<tr>
<td>WIP</td>
<td>100 parts</td>
<td>7 parts</td>
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<tr>
<td>Machines</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Spindles</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>Total Machine Time</td>
<td>54</td>
<td>10</td>
</tr>
</tbody>
</table>

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Bring PARTNERS TOGETHER at part conception

DESIGN cost OUT not IN the component

Choose the RIGHT TOOL & Technology to achieve the critical features

SPECIFY MACHINE CHARACTERISTICS required to take advantage of the tool’s features

Collaboration for Industry Productivity & Responsiveness!