Use of Abrasive Waterjet Cutting Systems for Improving Manufacturing Flexibility and Efficiency with Titanium Components

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Abrasive Waterjet Cutting Systems

• What are they and how do they work?
• What are their capabilities relating to titanium?
• What are their limitations?
• How can they be used for improving production of titanium parts
• Examples
• Q & A
Typical Cutting Systems—from 2’ x 2’
To 10’ x 40’
Abrasive entrained into the water stream does the cutting
Benefits of the AWJ Process

• No heat or flame or—cold cutting
• Virtually any material
• Wide range of thicknesses
• No induced stresses
• Narrow cut width permits cutting of intricate shapes
• Low mechanical cutting forces
• Simple fixturing
• Relatively fast
• Environmentally benign
Limitations of the AWJ Process

- Through-cutting process
- Striated surface finish can affect fatigue life unless a secondary operation such as grit-blasting is employed
- Jet geometry issues—jet lag and taper
Limitation—The Jet Bends
Modern PC-based Control Means Quick Accurate Parts Directly from a Drawing File
Automatic Taper Compensation
One-off Parts made directly from a CAD file to an accuracy of +/- .005” in material up to 2” thick
The AWJ Cutting Process Loves Titanium

- Titanium cuts 33% faster than mild steel
  - ¼” thick—36 ipm separation, 12 ipm precision
  - 1” thick—9 ipm separation, 3 ipm precision
  - 2” thick—4 ipm separation, 1.5 ipm precision
  - 4” thick—1 ipm separation, 0.3 ipm “precision”
How AWJ can improve manufacturing of titanium components

- Production of flat +/- .005” tolerance parts on an as-needed basis
- Production of intricate parts
- Production of close-nested parts to save material
- Roughing out parts to save on machining time and material
Production of final parts as needed
Rough cutting thick blanks
Intricate nested parts
Where do we go from here?

• Ongoing improvements in cutting accuracy—now producing some parts in the range of +/- .001”

• Decreasing production time from better control algorithms and more power at the nozzle

• Greater system reliability and lower maintenance costs

• Increasing range of Titanium applications

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