May 16th, 9:00 AM - 12:00 PM

Reducing Flagging and Fraying in Composite Sandwich Panel Machining

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Kutz, Stefan and Donaldson, Georgia, "Reducing Flagging and Fraying in Composite Sandwich Panel Machining" (2018). *Scholars Week*. 34.  

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Reducing Flagging and Fraying in Composite Sandwich Panel Machining
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Western Washington University
Zodiac Aerospace Cabin Interiors

Background
- Composite sandwich panels provide a lightweight and strong alternative to traditional materials
- Zodiac Aerospace fabricates panels for aircraft interiors
- CNC milling causes flagging and fraying
- Flagging and fraying causes out of tolerance parts and assemblies
- Employees manually remove flags and sand rough fiberglass edges
- Secondary processing increases cycle time

Project Description
Assumptions and Limitations:
- Develop solution compatible with current CNC routers and tools
- Add no additional processes
- Maintain or improve production

Observations:
- Top and bottom face sheets have different fraying attributes
- Current tool engages the fiberglass only every half rotation
- Flag creation is dependent on cell boundary

Current Proposed Solutions:
- Prioritize conventional cutting
- Lead angle of 45°
- 50% radial engagement
- Blind pocketing operations should be performed on the rough face sheet to reduce fraying

Background
- Analyze cutting process using high speed videography
  - Photron Fastcam Mini AX200
  - Improve 5-axis machining strategies
  - Optimize cutting parameters
  - Optimize cutting strategies
  - Lead and lag
  - Investigate a variety of cutting tools

Innovation
- Taxonomy of Flagging Types
- Mastercut tool throwing a chip
- Fullerton tool wrapping up a chip

Anticipated Impact
Zodiac Aerospace Benefits:
- Reduced cost of composite sandwich panel machining
- Eliminate secondary operation of manual flag removal

Industry Benefits:
- Electric Automotive
- Performance Marine
- If the cost of machining is reduced composite sandwich panels and their benefits will be more accessible to a broader range of industries

Path Forward
- Reduce flagging and fraying using a technique that can be implemented by Zodiac Aerospace
- Use high speed videography to analyze different tool cutting behaviors
- Standardize tool used across the company
- Develop ideal cutting parameters
- Identify a tool that would be better suited for the composite material

Background
- High speed camera setup at WWU labs
- Capturing footage of a cut utilizing lead
- Burr style tool

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