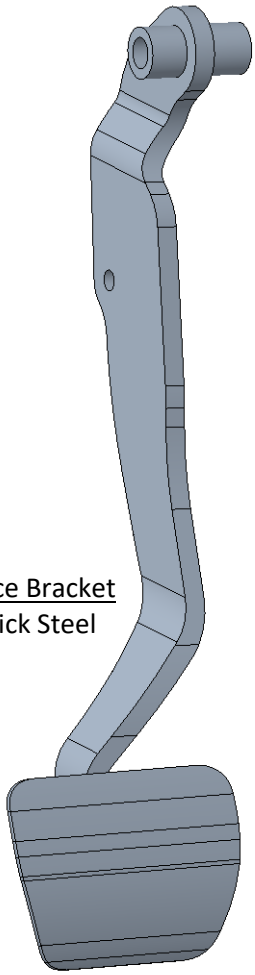
Virtual Engineering, Inc.

Engineering Your Competitive Edge…

Brake Pedal Weight Reduction Using Laser Welding

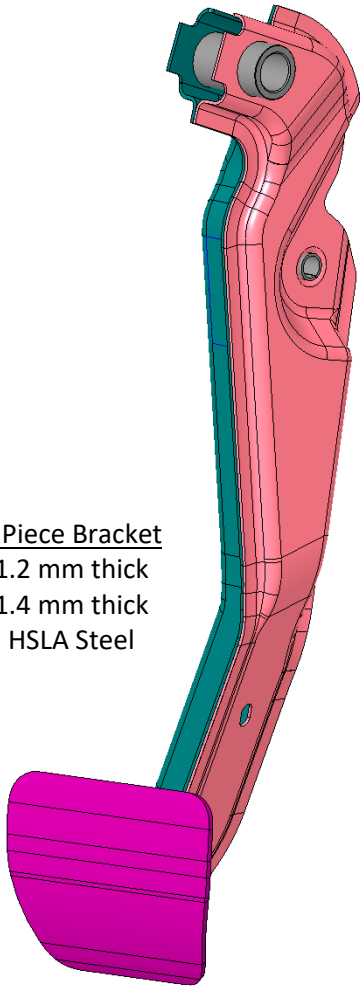
- **Objective:**
  - Create design options for a new brake pedal assembly

- **Constraints:**
  - Reduce mass from baseline design
  - Be a “drop-in” to the current environment
  - Avoid assembly fastener drive tool zones
  - Meet or exceed current performance specifications
  - Use laser welding with minimal fixtures and transfers during construction



Single Piece Bracket
8 mm thick Steel

Baseline Design
2.11 lb.



2 Piece Bracket
1.2 mm thick
1.4 mm thick
HSLA Steel

Concept Design
1.44 lb.

Laser Welded Prototype

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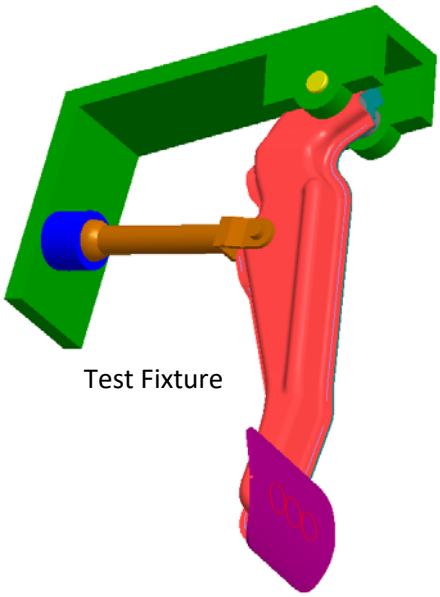
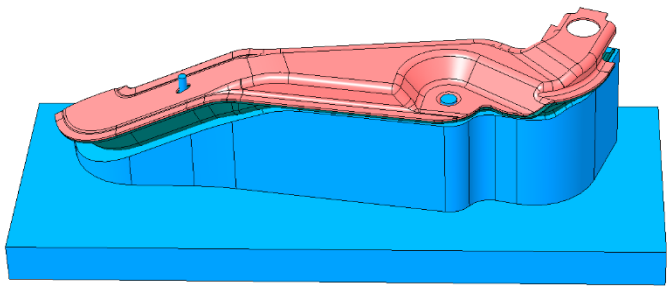
- **Process:**
  - Researched brake pedal functions and dynamic reactions in a crash
  - Benchmarked several brake pedal assemblies
  - Researched laser welding process for use in Concept design
  - Evaluated current design, vehicle environment, and specifications
  - Created multiple concept CAD models in Creo Parametric
  - Supported Design Reviews on a regular basis
  - Ran FEA for current design and concepts
  - Optimized design concepts based on FEA results
  - Interfaced with bushing supplier to get appropriate part for prototype and testing
  - Completed tolerance stacks and developed GD&T
  - Defined fixtures used in laser weld operations
  - Created drawing package and BOM for prototype quotes
  - Created Engineering Specification for test quotes
  - Assisted in prototype supplier reviews and selection
- **Results:**
  - ***0.67 lb. LESS weight***
  - ***50% LESS displacement (FEA)***
  - ***Comparable stress levels (relative to material yield strengths)***
  - Is a “drop-in” component (based on environment, packaging, and assembly tools)
  - Only one fixture and set-up for laser welding



Test Fixture



Laser Welding Fixture

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