McMaster EcoCAR Rear Tub and Cooling System Project

September 2023-Present

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1. Rear Tub Redesign

Note: Due to NDA Regulations, I cannot show final designs (CAD Files) of the rear tub

Figure 1: McMaster EcoCAR Rear Tub with Connected Automated Vehicle (CAV) Components

1.1 Problem

The rear tub of the McMaster EcoCAR EV (Cadillac Lyriq) did not fit the design requirements, in terms of structural integrity, position, and structural attachments for various new parts going into the vehicle.

1.2 My Role

- Redesigning and CADing model in Siemens NX
- Engineering cooling system (intake and exhaust) of heat in rear tub
- Researching manufacturing methods
- Researching and implementing welding points

1.3 Our Solution

The rear tub of the McMaster EcoCAR EV underwent a structural redesign to accommodate the integration of the new in-house inverter and house Connected Automated Vehicle components, while also addressing the repositioning of the rear subframe. This redesign aimed to create a secure

mounting platform for the advanced technologies and ensure seamless integration, contributing to the vehicle's overall structural integrity and performance.

1.4 Manufacturing

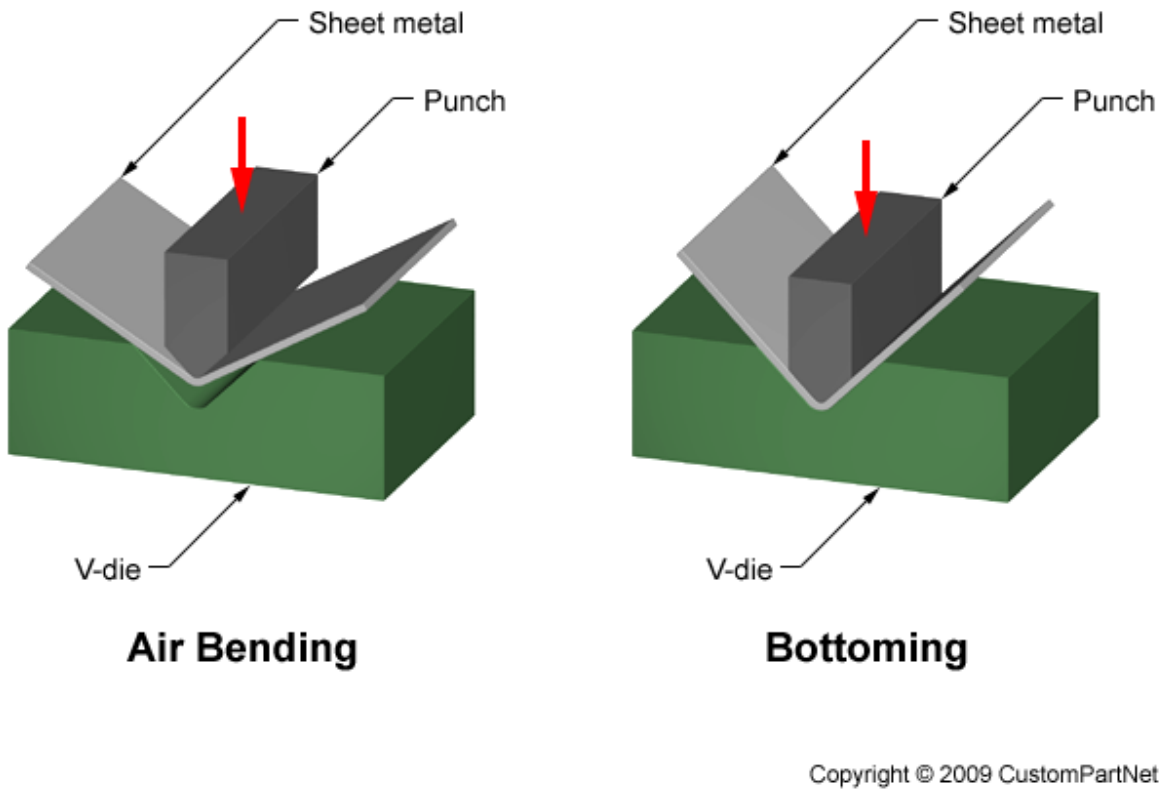

Figure 2: Air bending of sheet metal

Our design implementation involved a comprehensive exploration of diverse manufacturing techniques. These included the meticulous application of dimple dye press, precision bending, and CNC machining. We decided to use **precision bending** as our manufacturing method due to its ease and big metal gauge.

1.4 Welding

Figure 3: Mig welding

Welding points were strategically incorporated, utilizing both **spot welds** and **plug welds**. This multifaceted approach showcased the versatility of our manufacturing capabilities and ensured a robust execution of the design, meeting the exacting standards required for the McMaster EcoCAR EV project.

2. Cooling System

Note: Due to NDA Regulations, I cannot show final designs (CAD Files) of the cooling system

Figure 4: Back of the Cadillac Lyriq

1.1 Problem

The rear tub of the McMaster EcoCAR EV (Cadillac Lyriq) with all the CAV components had no displacement of air (since it was directly under a false floor) and was rapidly overheating.

1.2 My Role

- Redesigning and CADing custom brackets and HVAC tubing for air displacement.
- Design of routing system to move air throughout the entrance and exit of holes in the rear tub area.
- Implementation of the cooling system tubing, brackets and hardware.

1.3 Our Solution

A new routing system was designed to displace air from the AC vents under the driver and passenger seat to the rear tub area. From there, the air further exits through the OEM backpressure holes with fans.

1.4 Design Considerations

- Flexible materials (TPU) were used to create the tubing, as the tubing was routed in the interior floor where people may step on it and deform it.

- A mix of TPU flat tubing and HVAC tubing was used throughout the system to navigate through the ridges without having to cut holes in the Lyriq