

IACMI Future Mobility/Vehicles Technology Working Group Summary

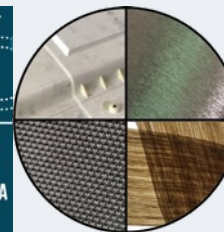
June 20, 2023



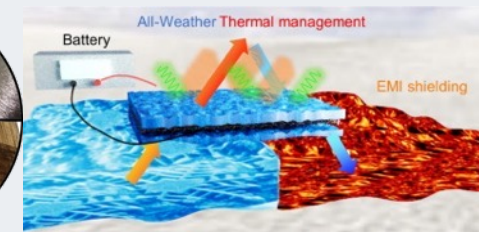
**Circular
Economy**



Digitalization



**Materials &
Manufacturing**



**Multifunctional
Integration**



**Skills
Development**

Convene. Connect. Catalyze.

FMVT WG Steering Committee - Openings



Sid Asthana
Polymer24



Dan Coughlin
ORNL



Cliff Eberle
IACMI



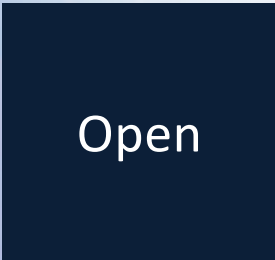
Ginger Gardiner
CompositesWorld



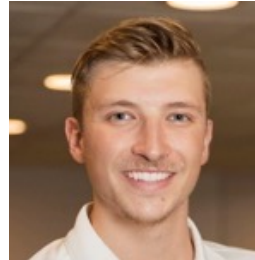
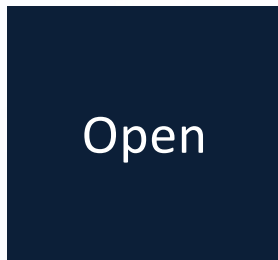
Hendrik Mainka
Co-chair
Volkswagen



Ray Boeman
Co-chair
Michigan State University



Eric Haiss
IDI Composites



William Henken
Volkswagen



Dale Brosius
Advisor
IACMI



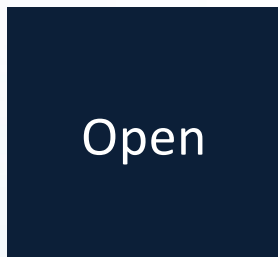
Uday Vaidya
Advisor
IACMI



Brian Knouff
ORNL



Dana Lowell
Helicoid



Steve Nolet
TPI Composites

Objective – Materials & Manufacturing INNOVATION (MMI)



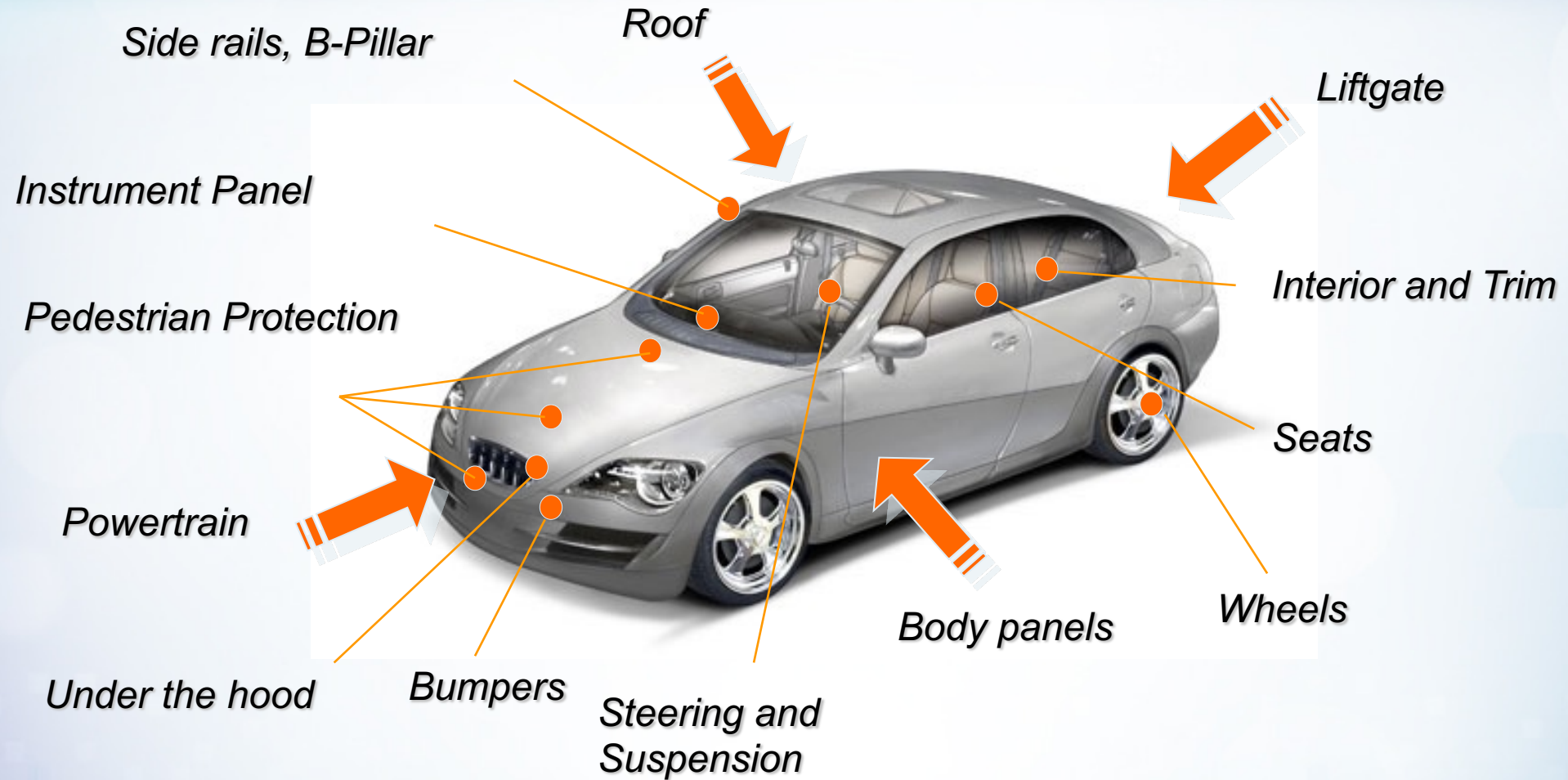
- ◆ Develop, mature, & scale-up emerging innovative materials and manufacturing technologies that can significantly differentiate composites unique value proposition for future mobility.
 - ◆ *Far beyond demonstrating COTS technology in an application.*
- ◆ Provide a platform, framework, and roadmap for:
 - ◆ Increased and broadened member recruitment, engagement, benefit
 - ◆ Coordinated workstreams to broaden member exposure while protecting IP
 - ◆ Opportunity to pursue parallel pathways (e.g., evaluate materials from multiple materials in new processes)

Approach

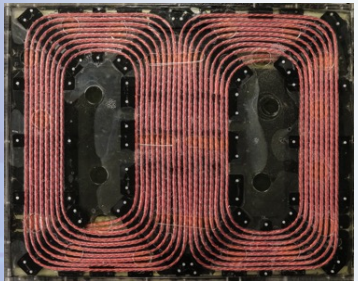
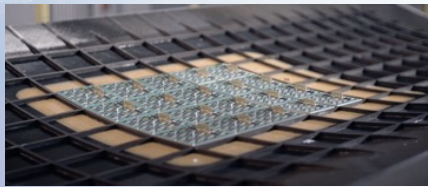
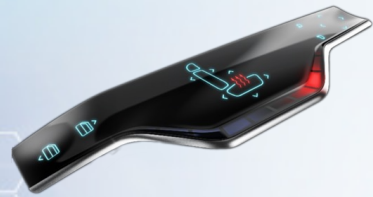


- ◆ Identify automotive components that are most enabled by emerging technology
 - ◆ Conventional vehicles
 - ◆ Battery Electric Vehicles
- ◆ Identify promising materials & manufacturing technology where advancements by IACMI and Members can make significant impacts
 - ◆ Cost – materials, cycle time, hybridization, multifunctionality, scrap, tooling, assembly, etc.
 - ◆ Value – attributes not possible with metals, increased functionality/package space
 - ◆ Sustainability – bio-derived/recycled materials, low scrap, non-paint technology
- ◆ Define workstream activities that mature promising technologies to enable most impactful automotive components - CONVERGENCE
- ◆ Address market barriers and Workforce Development opportunities

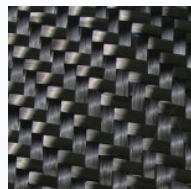
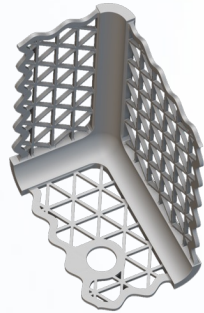
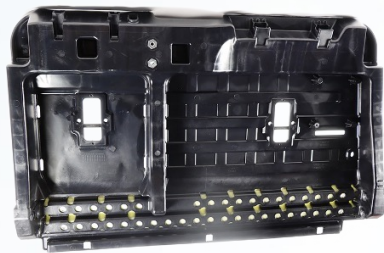
Many components are candidates for composites



Examples of emerging technologies



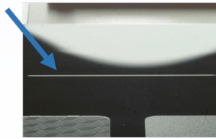
Molded in Functional Electronics



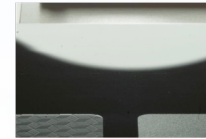
Over-molded for optimal performance & cost

» Scratch test according GS 97034-9 followed by self-healing

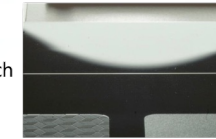
1st Scratch



Self-healing at 60°C



20th Scratch



Self-healing at 60°C

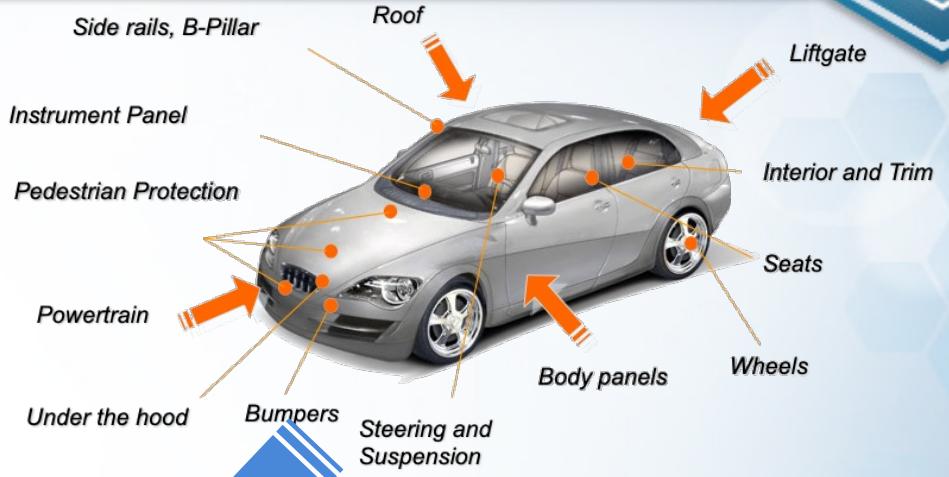
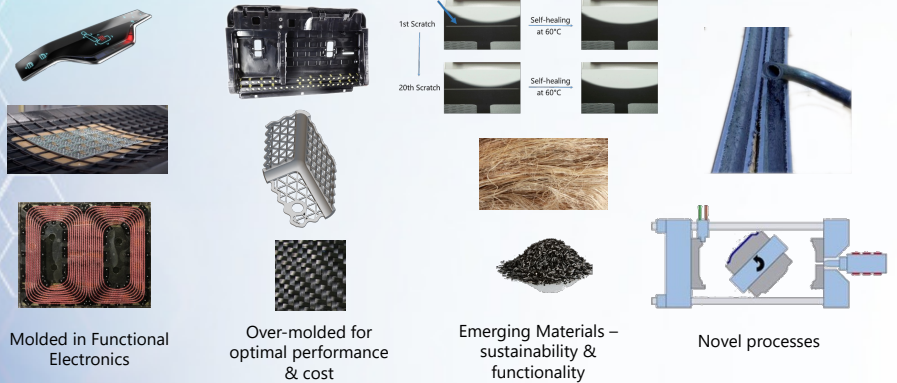


Emerging Materials – sustainability & functionality



Novel processes

Emerging technologies & high-impact applications define workstreams



Circular Economy

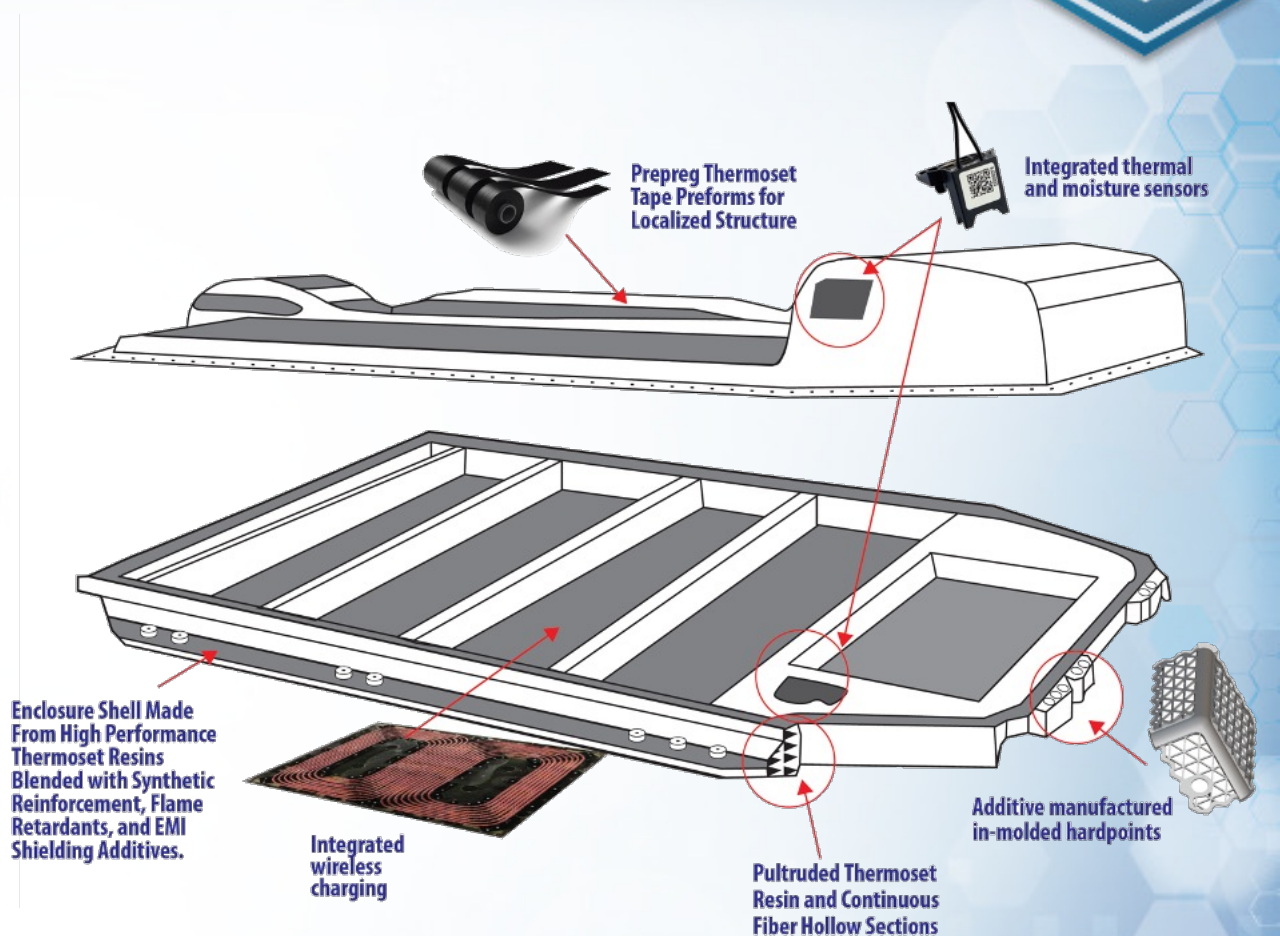
Digitalization

Materials & Manufacturing

Multifunctional Integration

Skills Development

Demonstrators are the platform to showcase MMI



Agenda for FMVT Working Group - Thursday, 6/22/2023

7:30 – 8:15am – Opening Presentations

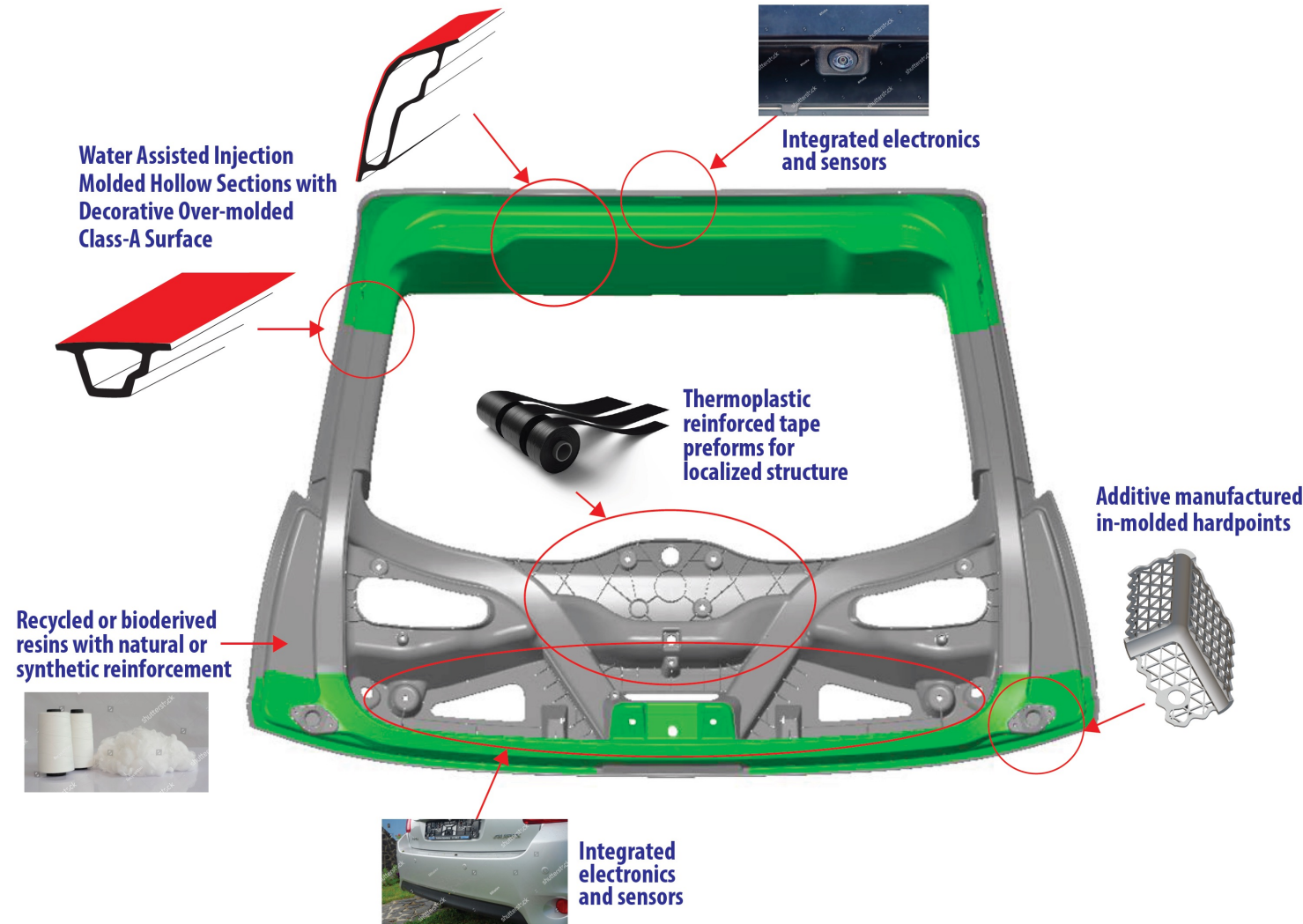
8:20 – 9:00am - Breakout

- Emerging Injection Molding Technology (Boeman/Vaidya)
- Additive Manufacturing - Compression Molding (Kunc)
- Roadmap to Commercialization (Knouff/Halsband)

9:05 – 9:30am - Breakout Reports

9:30am - Adjourn

Breakout 1 (Boeman/Vaidya) : Injection Molding Workstream Technologies



Value-add Technologies that:

- Add/Increase performance
- Reduce cost (materials, process, tooling & assembly)
- Integrate functionality
- Reduce weight
- Add value metals can't

Examples:

- In-mold coating – reduce paint
- Water-assist IM – hollow sections
- Functional Electronics
- Sustainable Materials
- Insert/hybrid molding

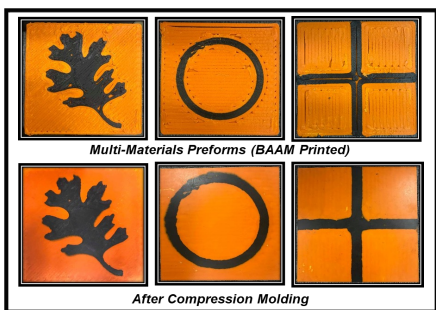
Breakout 2 (Kunc): Additive Manufacturing and Compression Molding

AM-CM



orbital
composites

Fast acting press being enhanced with shuttle system to enable shorter cycle times.



Compression molded AM multi-material preforms

Combining three-dimensional control of additive manufacturing with quality and efficiency of compression molding

- High-rate process (less than 3-minute cycle time demonstrated)
- Material with controlled microstructure
- Low porosity
- Multi-material capability
- Inspectable process
- Embedded components

- Continuous AM-CM
 - Making parts larger than press platens
 - Low CAPEX

Breakout 3 (Knouff/Halsband): Roadmap to Commercialize Emerging Materials/Technologies



- ◆ Goal is to accelerate adoption of new materials/technologies
- ◆ Determine the checklist that supply chain must navigate/be prepared for to have new technologies adopted by OEM?
- ◆ Define a roadmap and utilize in demonstration project
- ◆ May have different roadmap variants depending on workstream

Example: Emerging materials



Summary



- ◆ Future of mobility WG has is pursuing materials and manufacturing workstreams
- ◆ Workstream focus – Holistic solutions that have transformational impact
- ◆ Will meet June 22nd Thursday 7:30 AM
- ◆ Breakout sessions on three topics
- ◆ Please join us and engage with your best ideas
- ◆ Thank you!

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