November 17, 2016

Automotive Materials R&D at CanmetMATERIALS
Presentation to:
Standing Senate Committee on Energy,
the Environment and Natural Resources
CanmetMATERIALS

- **Mandate**: To develop and deploy technologies to improve all aspects of producing and using value-added products derived from metals and minerals
- Facilities in Hamilton, Ontario, and Calgary, Alberta
- **Research Areas:**
  - Clean Energy Production
  - Energy Distribution (pipelines)
  - Defence
  - Efficient Energy End-Use (transportation, industry)
- Pilot Scale Facilities
Automotive Materials Research at CMAT

- **Vehicle Lightweighting**
  - Challenge: to obtain 50% reduction in structural mass

- **Efficient Powertrain Materials**
  - Challenge: to obtain 5% improvement in fuel efficiency
  - Challenge: to offset all emissions through electrification

- **Energy Management Materials**
  - Challenge: to obtain 5% improvement in fuel economy

Ford Multi-Material concept

- HOT STAMPED STEELS: 37%
- STAMPED STEELS: 14%
- ALUMINUM CASTINGS: 29%
- ALUMINUM EXTRUSIONS: 13%
- ALUMINUM STAMPINGS: 7%
Advanced Materials for Transportation

- A multi-material structural solution is required (weight reduction potential %)
  - Advanced High-Strength Steels 10-28% 0.8-1.5x cost
  - Aluminum 30-60% 1.3-2x cost
  - Magnesium 30-70% 1.5-2.5x cost
  - Polymer Composites 50-70% 1.5-5x cost
- Near-net shape parts
  - Casting
  - Additive Manufacturing

Source: Car & Body Design
Why is this R&D Needed Now?

Source: International Council on Clean Transportation
Fuel Efficient Vehicles – Collaborative Technology Development

- Body made 8% lighter but 30% more rigid
- Smarter engineering for top crash safety performance
- Chassis redesign delivers greater stability and agility
Collaborative Research and Development

- Highly integrated research with academia
- Share facilities and expertise
- Support development of next generation of automotive engineers
- Leverage funding to create larger, more impactful projects
Recent Examples

GM’s new resistance spot welding process

CMAT’s contribution to the GM Al Spot Welding Technology

\[ \gamma = \tan(\alpha) \]

Source: Motor Authority

9-speed valve body cast at CMAT
Questions
Annex
Collaborative R&D

- Crude ore supply: Mont-Wright Mine (ArcelorMittal)
- Pellet Plant: Port Cartier (ArcelorMittal)
- Steel Mill: (ArcelorMittal Dofasco)
- Tiered Supply Chain or Auto Assemblers: Ford Canada - Oakville
Facilities and Capabilities – Melt, Roll, Form, Test

- Vacuum Induction Melting Furnace
- 500-ton, 600-hp Rolling Mill
- 500-ton Hydro/Gas Forming
- 75-ton Sheet Forming
- Fracture surface of a Charpy tested specimen, $t_{5,5} = 10s$