



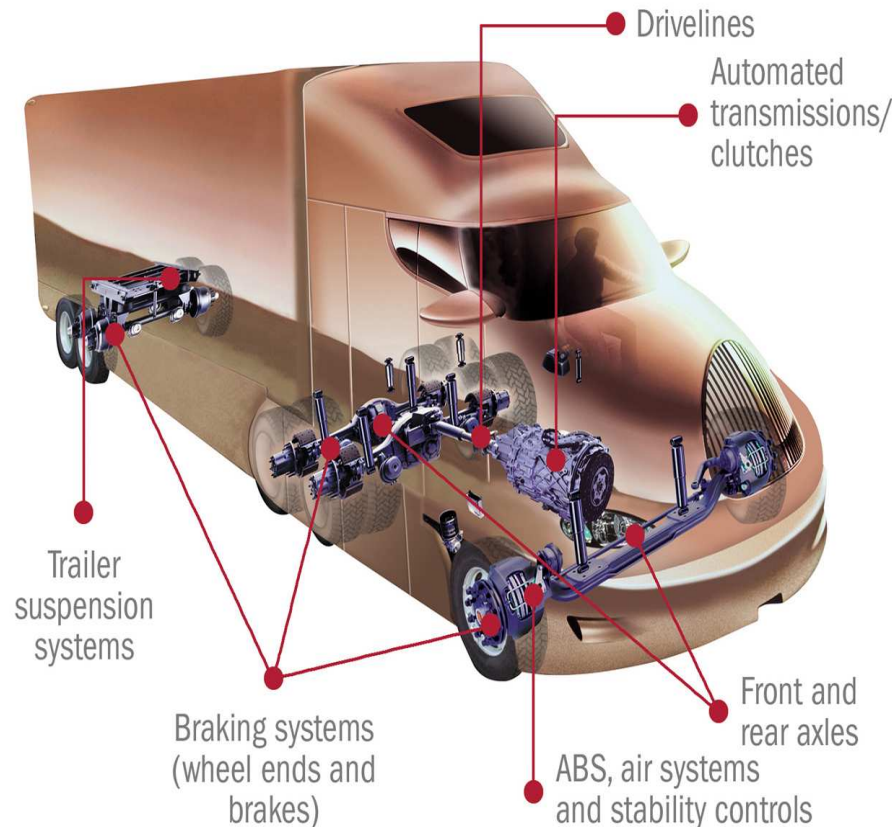
Session 3- Emerging Advanced Heavy-Duty Technologies and Designs

February 20, 2008

ICCT/NESCCAF Workshop "Improving the Fuel Economy of Heavy Duty Fleets II"

ArvinMeritor TM

Core Products and competencies



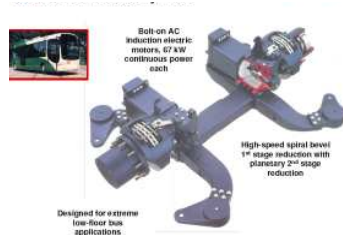
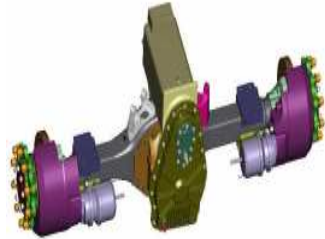
“Our expertise is torque distribution...”

- Experienced team with deep industry knowledge when integrating mechanical and electrical components
- Ability to design, test, and manufacture systems for real word environments
- Understanding the unique path to market for systems (creation, integration, delivery and service)

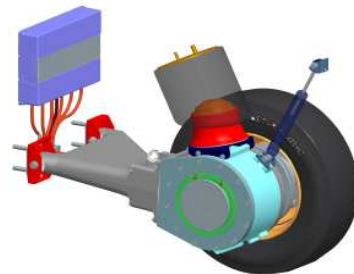
- 2007 Sales* \$6.4 billion
- Located in 25 countries global with 66 manufacturing facilities
- Business covers both passenger car and commercial vehicles
- 19,000 employees globally
- Technical centers globally in North America, Europe, and Asia

ArvinMeritor History in Alternative Drives

Past



Present



We've targeted -
More fuel efficient vehicles
with lower emissions
and greater market penetration
enabled by technology that:

makes them perform better
makes them last longer, and
makes them more affordable.

...what we see for the Future

Full BEV Zero Emission Vehicle



- 18 month white sheet development program
- Product whose technology differentiates ArvinMeritor from other electric drivetrains
- Improvements in fuel efficiency, emission and productivity derived from ArvinMeritor Drive Corner Module and the unique vehicle design from Unicell
- Successfully completed first set of fleet testing trials

... building on today's success...



Today's emerging technologies will take us from what is

Feasible

to what is

Affordable

- GVWR 16,000 lb.
- Full BEV
- Zero emissions
- Completely flat floor, RFID controlled doors
- Rear kneels to ground level
- Clear aisle for pallet delivery
- 40' Curb to curb turning circle
- ARM supplied Drive Train, Electrified Braking, Steering, & Suspension

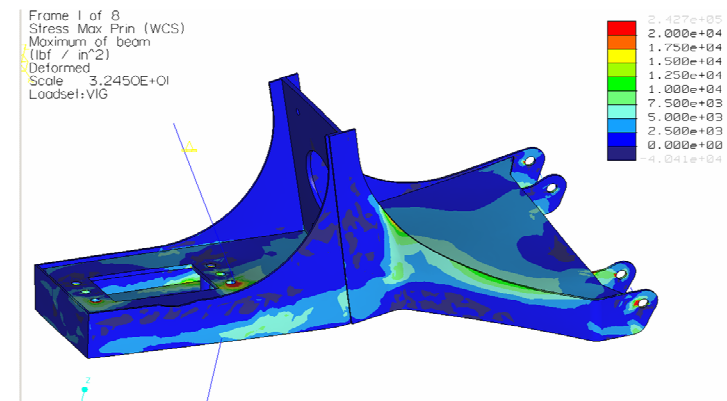
Today's Technology Baseline . . .

- Modeling and Simulation
 - Initial models were performance based
 - Good but not as predictable as desired
- Energy Storage
 - Lower voltage packs (nominal 300V) less than 10kWHrs)
 - Smaller packs (less than 10kWHr)
 - Various chemistries
 - Minimal cell and thermal management
 - 500 cycles @ 70% DOD
 - Learn as you go packaging
- Electric Traction Machines
 - smaller machines
 - aimed at ISG or mild hybrid applications
 - limited availability of HV, High Current Semiconductors
- Electrified Accessories
 - solutions evolved from 'Industrial' technology base.
 - more opportunity than availability
 - targeted at removing continuously powered engine/belt driven devices.



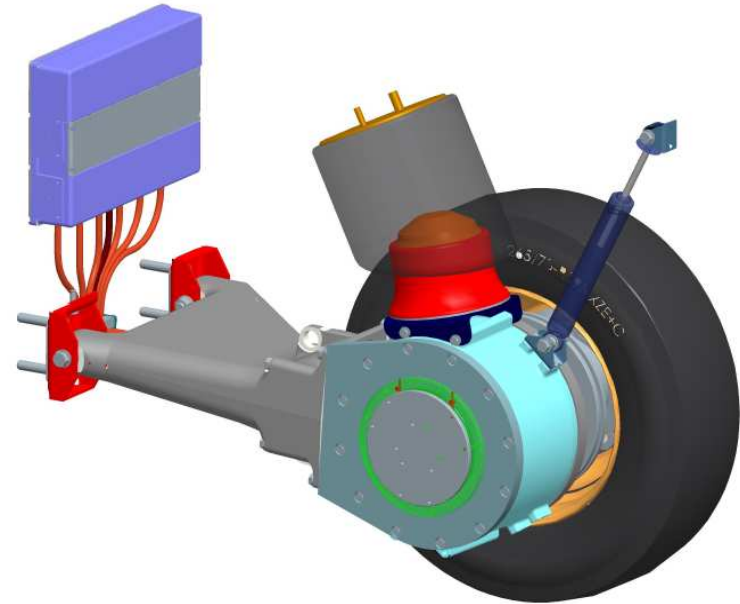
Tomorrow we will have . . .

- Simulation
 - Right size components – neither over designed or underperforming systems – right sized = lowest cost
 - Better thermal management models where higher efficiency = minimal losses = minimal thermal management required
 - Higher confidence – predictable performance, improved efficiency, second order affects included
 - Life cycle models – reduced component stress, predictable reliability for a given environment



Tomorrow we will have . . .

- Traction Machines
 - No longer one size fits all, i.e. 60 to 300 kW = more truck architectures possible
 - Scalable to the Vehicle and its Vocation = lower development costs
 - Integrated System (controls, cooling, gearing) = lower cost, smaller and lighter weight designs
 - Matched to the vehicle duty cycle for best efficiency
 - Extended environmental operating range

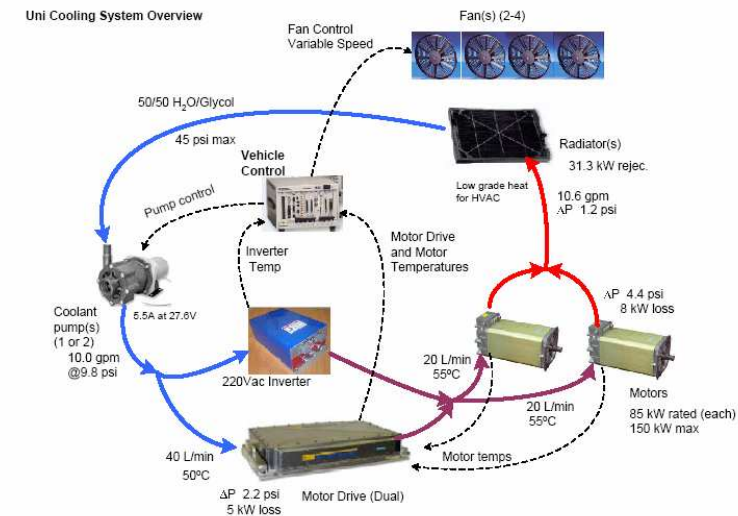


Tomorrow we will have . . .

- Energy Storage
 - Larger cells, more cost effective robust architectures
 - Larger packs from multiple suppliers allowing for better performance and longer range
 - Higher voltages and more system efficiency
 - New Chemistries – safer, longer life, > 1000 80% DOD cycles, with talk of 2000 'soon'.
 - More robust cell management with predictable life and reliability
 - Standardized Packaging for the Commercial Vehicle Market.

... more emerging opportunities

- Electrified Accessories
 - Available today:
Electrified Hydraulic Braking
 - Needed:
Electrified cooling systems-transition from low voltage controlled pumps and fans to direct HV drive
 - Needed:
Electrified Power Steering-upscale light vehicle concepts



Prep'd by Joe T. Updated May 13th, 2005
File: uni low V sys opt - config 6.vsd

Mar 28th, 2005

Where the future finds us:

	Today	The Future	Benefits for the customer
Modeling & Simulation			Improves system performance, lowers cost and risk, shorter development time and improved efficiencies.
Energy Storage (Commercial Vehicle Battery Packs)			Longer range, lower life cycle costs, more reliability, safer.
Traction Drives			Lower weight, lower cost, better thermal management shorter design cycles.
Electrified Accessories			Greater system architecture options allowing for higher system efficiencies.

Hybrid Dream Machines:

- Vehicle Performance better than traditional drive systems
- Scaleable / Modular Electric Drive Components - quicker time to market, right sized for optimized performance and lower cost.
- Packaging Flexibility – more suspension, and system architecture options, more vehicle layout options, adaptable to existing vehicle architectures
- Regenerative Braking programmable per application, with slip/traction control capabilities
- Reconfigurable / Reusable components – lower initial cost, easier to maintain
- Lower Center of Gravity and better weight distribution
- Systems optimized for the Users Operations
- Reliability equal/better than today's proven technologies
- Lower Life Cycle Costs– low risk, shorter payback timeframe