

HTUF Hydraulic Hybrids Breakout Session

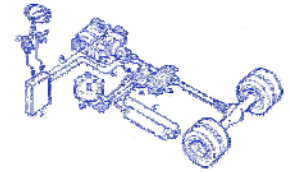
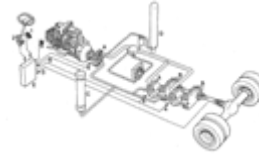


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Evolution: Parker Hydraulic Hybrid Technology

Early 90's

Cumolo Tech.
Nissan Bus Fleet
Fiba-Canning Demo.



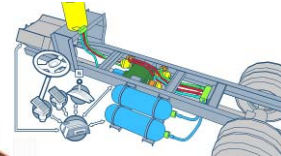
2005-2006

Alpha Prototype Developed
Concept Verified
Fuel Economy Demonstrated



2007-2008

Beta Prototype
System / Vehicle Optimization
Base field test evaluation



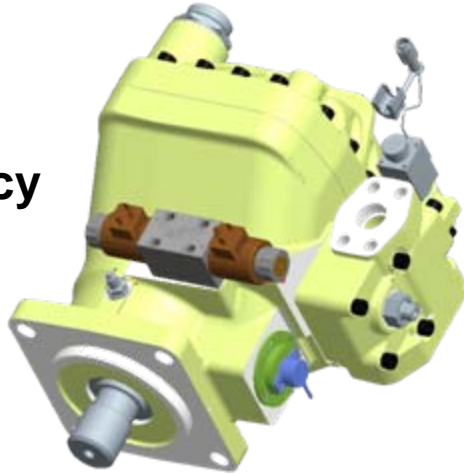
2009-2010

Field Evaluation / Customer Feedback
Reliability and Performance Verification
Preparation for Series Production



Parker Enabling Technologies

**High Efficiency
Pump/Motor**



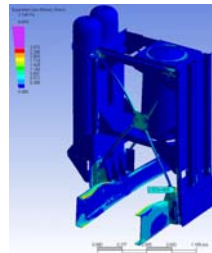
**Light Weight Composite
Accumulators**



**Advanced Controls
Capabilities**



**Advanced
Design Tools**



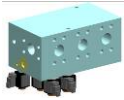
Parker Chelsea
Power Drive Unit



Commercialization Partnership Strategy



GAD



HPD



HVD



PMDE

Filtration



Conn/Hose



ECD



CPD



TCS

Energy Recovery
Business Unit -
CPD



Vehicle
OEM's



End User 1

End User 2

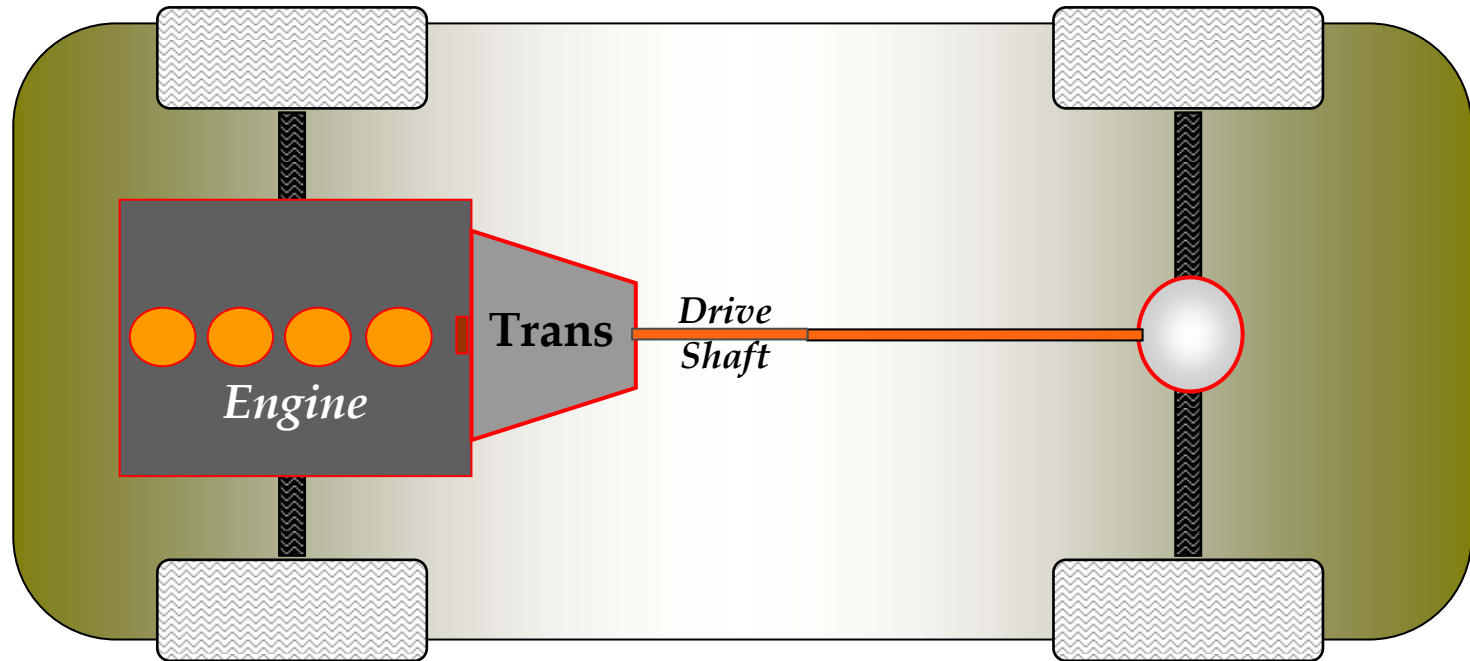
End User 3

Advantages of Hydraulic Series System Technology



- Full Engine Management to achieve maximum economy and emissions
- Capability to convert 70% plus of available Braking Energy. System can absorb 500+ horsepower.
- Parker also offers Advanced Series Hydrostatic Technology featuring:
 - Two-speed hydrostatic drive for low speed efficiency, and
 - Mechanical Direct Drive for high speed efficiency.

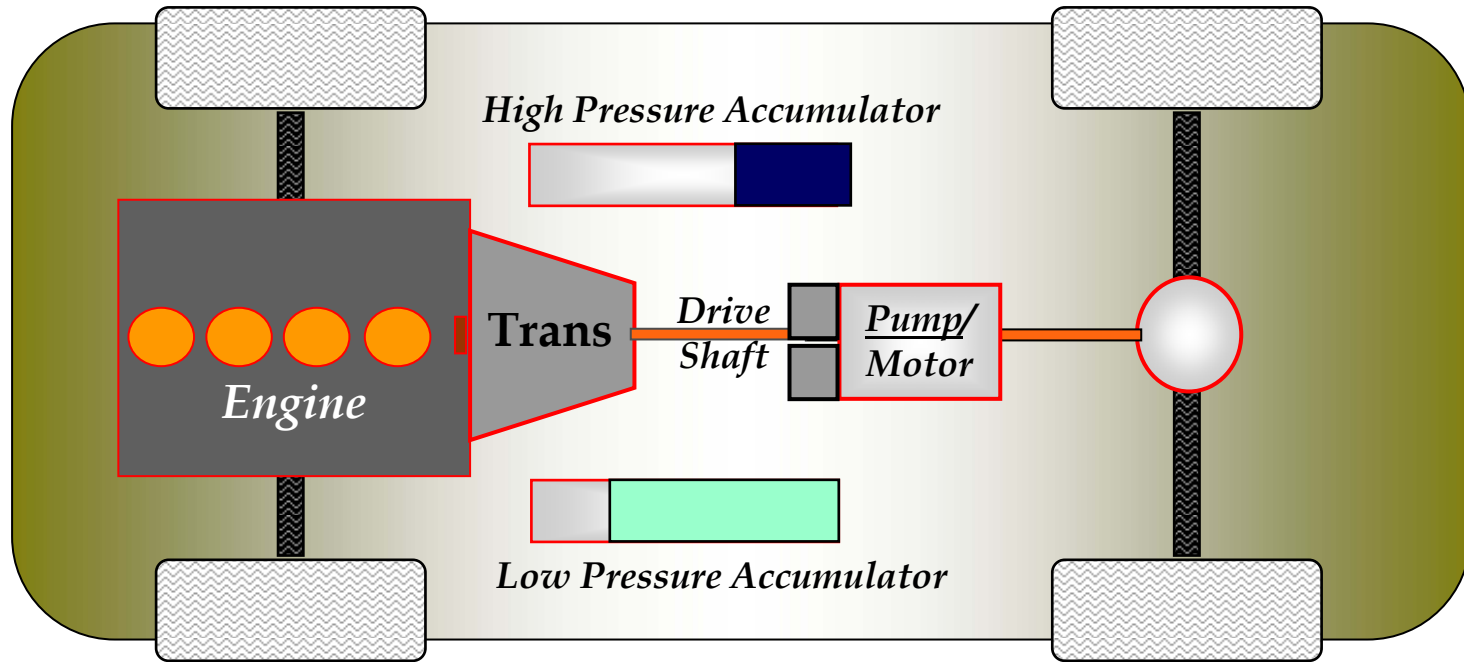
Conventional Mechanical Driveline



Conventional Drivetrain

- Torque Converter Losses (conv. AT)
- Very Limited Engine Management
 - No Brake Energy Recovery

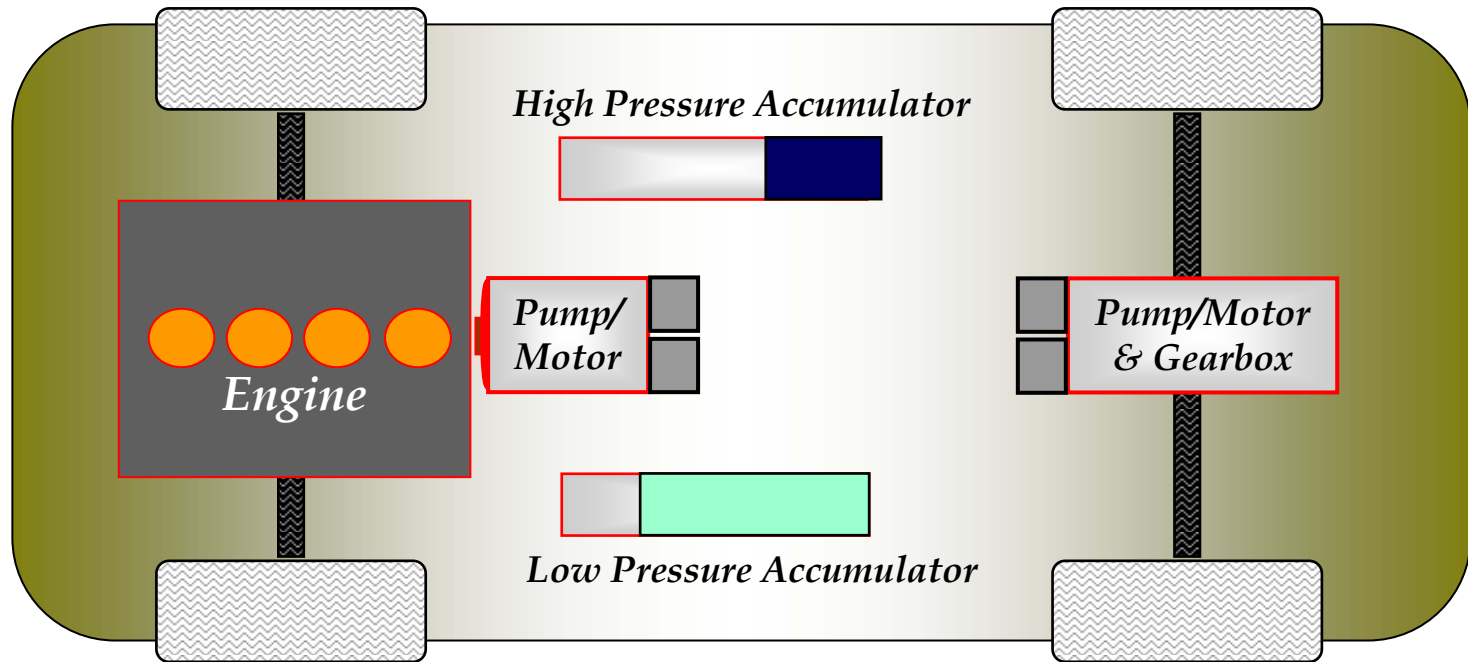
Parallel Launch - Hydraulic Hybrid



Launch Assist with Brake Energy Recovery (BER)

- Limited Engine Management
- Existing Drive Train Intact, Retrofittable
- Enables Brake Energy Recovery

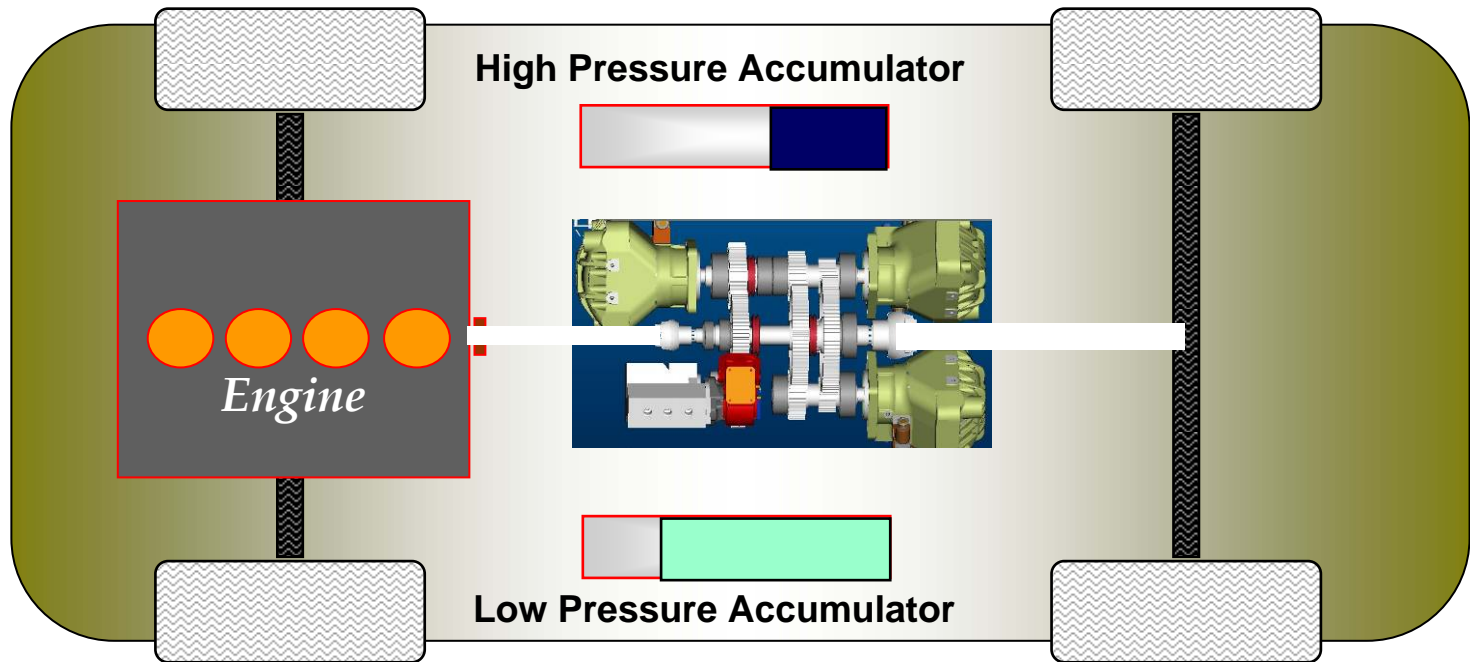
Parker Full Series Hydraulic Hybrid



(Series) Hydrostatic Drive with Brake Energy Recovery

- Very efficient during stop and go driving
 - Full Engine Management
- Hydraulic losses can limit efficiency during high speed driving

Parker Advanced Series Hybrid (Refuse)



(Advanced Series) Hydrostatic Hybrid Drive with Brake Energy Recovery

- Goes Beyond Series Hybrid Drives, maximizing efficiency via
 - Low speed Hydrostatic 0-25 MPH
 - High speed Hydrostatic 26-45 MPH
 - Mechanical drive 46-65 MPH

Extensive Customer Field Testing

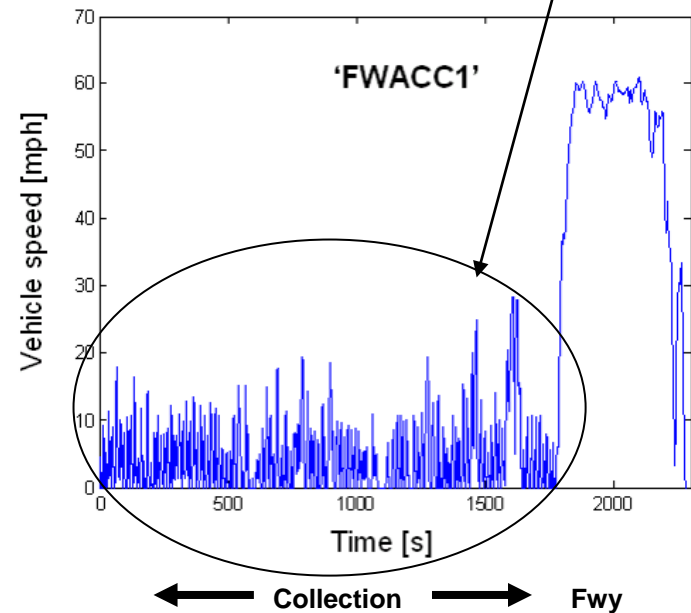


- Achieving Customer Insight =
 - Greater Level of Understanding
 - Maximum Results of Technology
 - Thorough Design Validation
- Parker Continues Intensive Field Testing in Severe Duty Applications.
- Durability and Reliability Testing Continues to be a high priority.

"Real World" Field Test Results

30% to 50% Overall Reduction in Fuel Used

Typical Refuse Collection Cycle

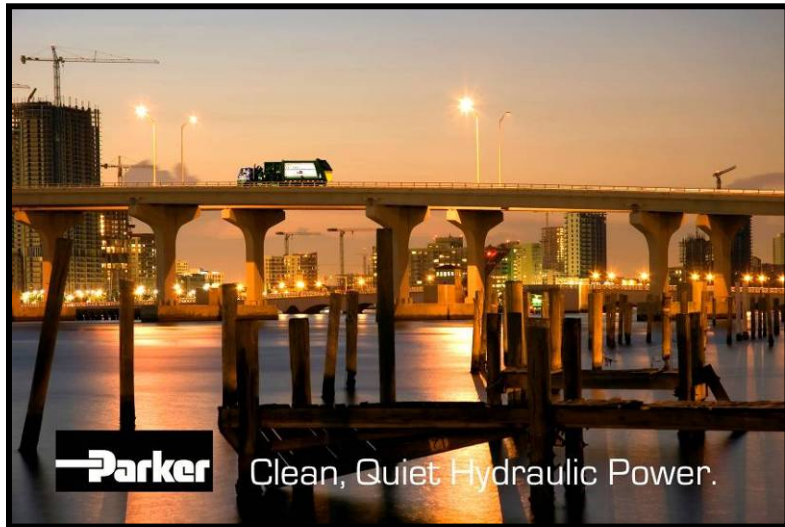


Fort-Worth Demo – Sept. 2008



- Trial ran 9/08 – 9/26: 10 days on route
- Consumed 28% less fuel
- Collected 3% more houses; 3% more tonnage
- Positive driver feedback
 - Acceleration, smoothness, quietness, braking

Florida Field Trials – May 2009



- 3 Week Trial
- 43% Overall Fuel Savings
- 24 month Brake Life Validation
- Positive Driver Feedback
 - Acceleration, smoothness, quietness, braking

Nevada Field Trial Results



- 4 Week Trial
- 35% Overall Fuel Savings
- 30 month Brake Life Validation
- Positive Driver Feedback
- High Temperature Performance

Pontiac Field Trials – Sept 2009



- 3 Week Trial
- 45% MPG Improvement
- Advanced Engine Off
- Positive Driver Feedback

UPS Pilot Review October 2009



- Cleared by UPS for Field Trial
- Customer Very Positive on Performance
- 4 Week Trial Scheduled for Nov. 2009
- Planned for Cleveland

No other Class 8 Refuse Hybrid can match the Fuel Savings or Performance of a Parker RunWise System

Class Leading Technology –

- Fuel Savings (30% to 50%)
- Brake Savings (24 mo. to 36 mo)
- CO2 Reductions (30% to 50%)

Class Leading Benefits –

- Improved Drivability
- Increased Productivity
- Increased Profitability





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