



Cummins Engines

Minot, ND

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Agenda

- Introductions 5 Mins
- Horsepower or Torque? 10 Mins
- Fuel Economy 15 Mins
- Product Line Update 5 Mins
- Service Topics 10 Mins
- Q & A 30 Mins

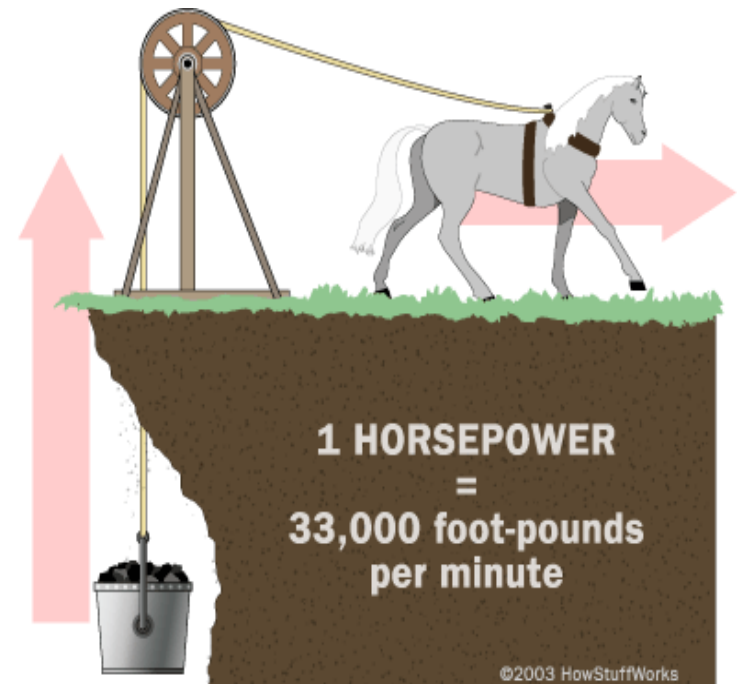


What is more important?

Question: Horsepower
 or
 Torque

Definitions

- Torque (ft-lb)
 - Rotating or twisting force (ft-lb)
 - Energy (work) produced by an engine
- Horsepower (Hp)
 - Measure of capability
 - Rate of doing work





Torque

■ Key Points

- Advertised torque is Peak Torque:
 - Occurs at lower engine speeds
 - Associated with towing, hill climbing, and acceleration

- Torque determines how much Hp is available

$$Hp = \frac{\text{Torque} \times \text{RPM}}{5252}$$

- “Where there’s smoke, there’s fire” ...
Where there’s **Torque**, there is **Hp**



Horsepower (Hp)

- Key points
 - Advertised Hp:
 - Normally (not always) reflects the maximum Hp
 - Does not always reflect **usable** horsepower
 - Hp **available** in operating range is critical
 - Determines how much work the engine can do ... climb grades, tow, accelerate, etc.
 - Performance curves show Hp versus RPM
 - All manufacturers rate Hp the same ... at the flywheel (not wheel) & to SAE standards



Advertised Power

- Advertised Hp doesn't always tell the story:
 - Gasoline 340 hp
 - Diesel 330 hp

Based on advertised hp, one might think the gas engine would perform better than the diesel.



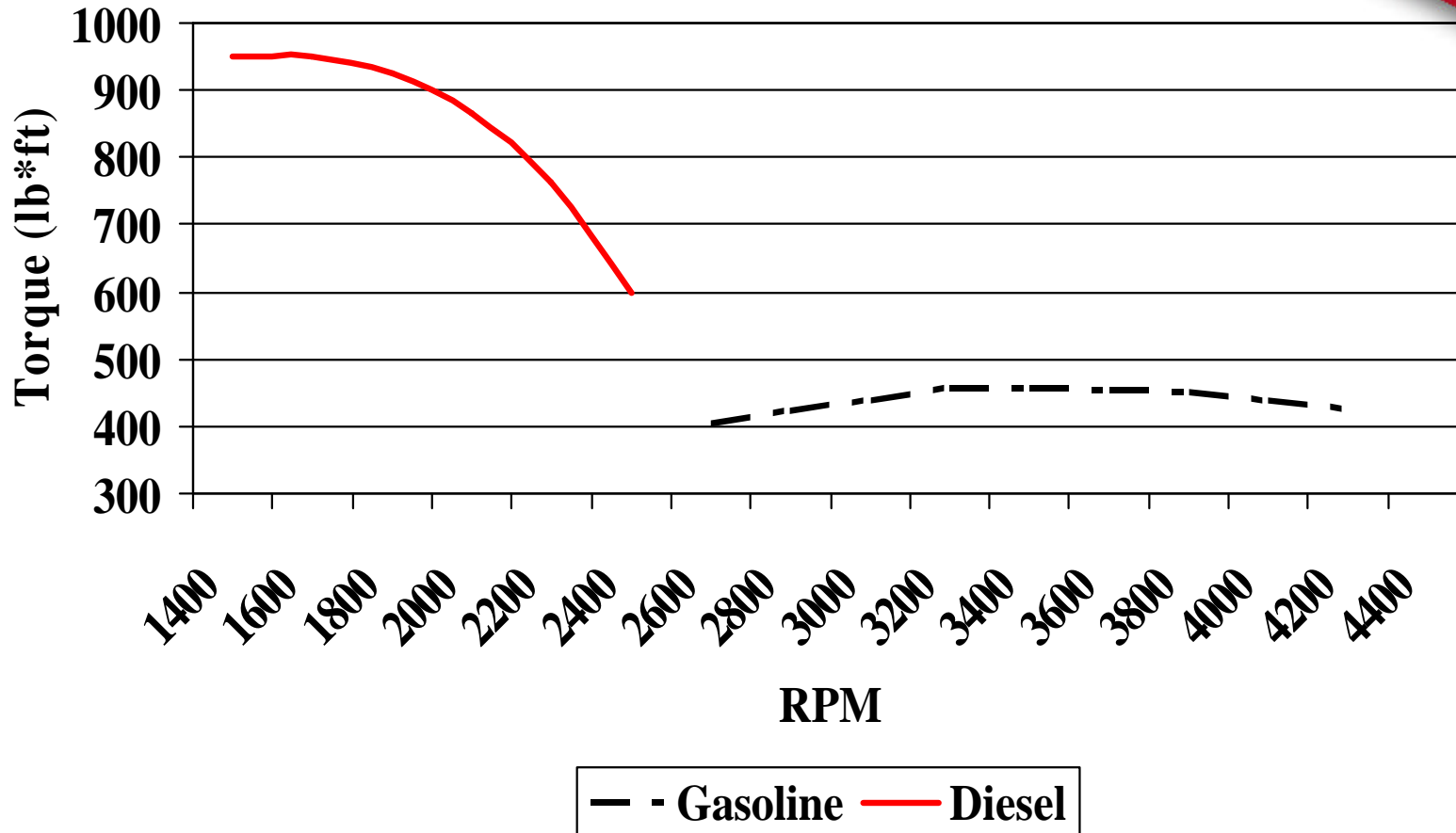
Advertised Power

- Advertised Hp doesn't always tell the story:
 - Gasoline 340 hp @ 4200 rpm
 455 lb ft @ 3200 rpm
 - Diesel 330 hp @ 2400 rpm
 950 lb ft @ 1400 rpm

Speed at which HP occurs and Torque dictates the engine's performance.



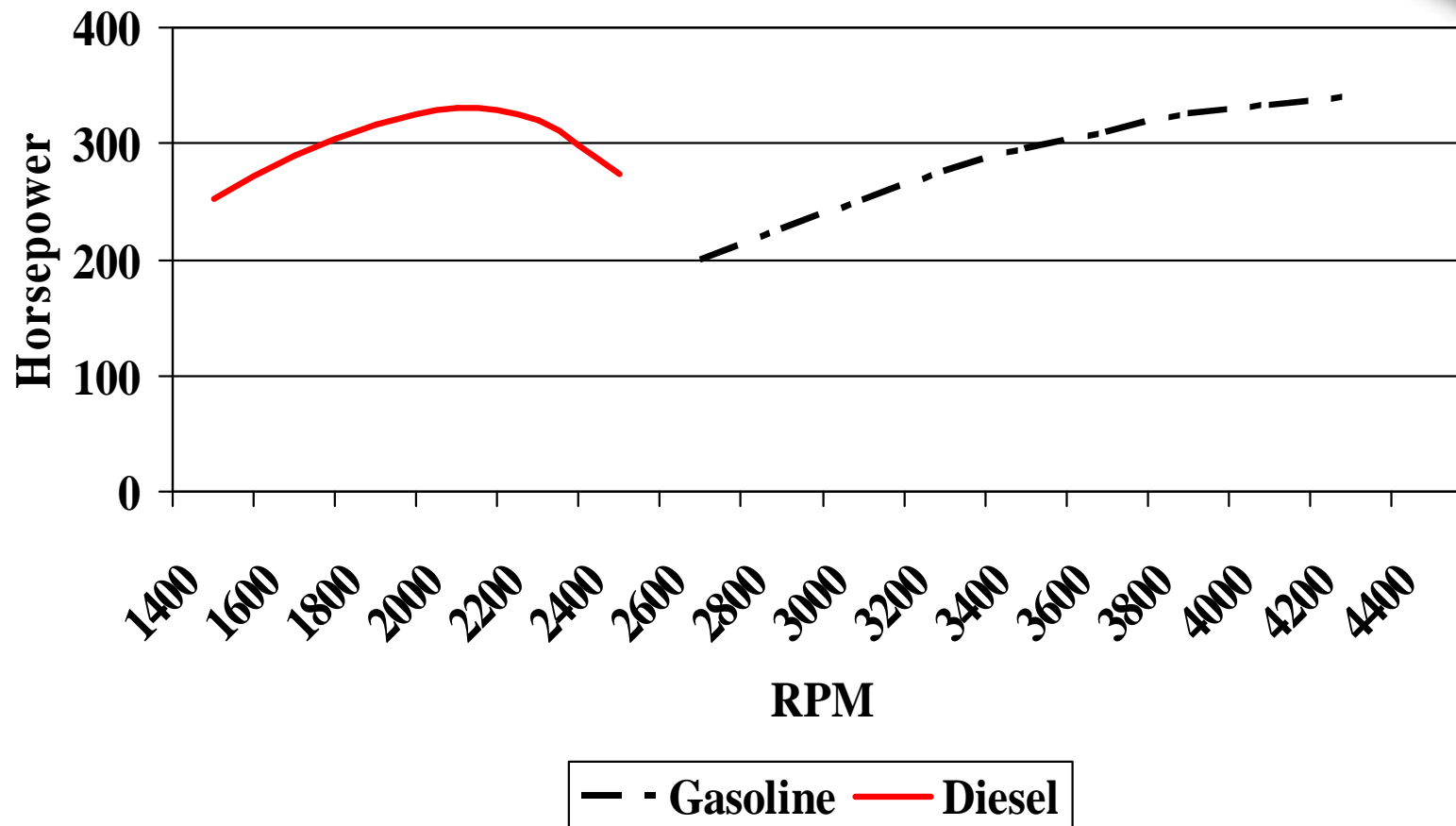
Torque Curves



Diesel delivers torque at lower engine speeds ... closer to the vehicle's normal operating range



Horsepower Curves

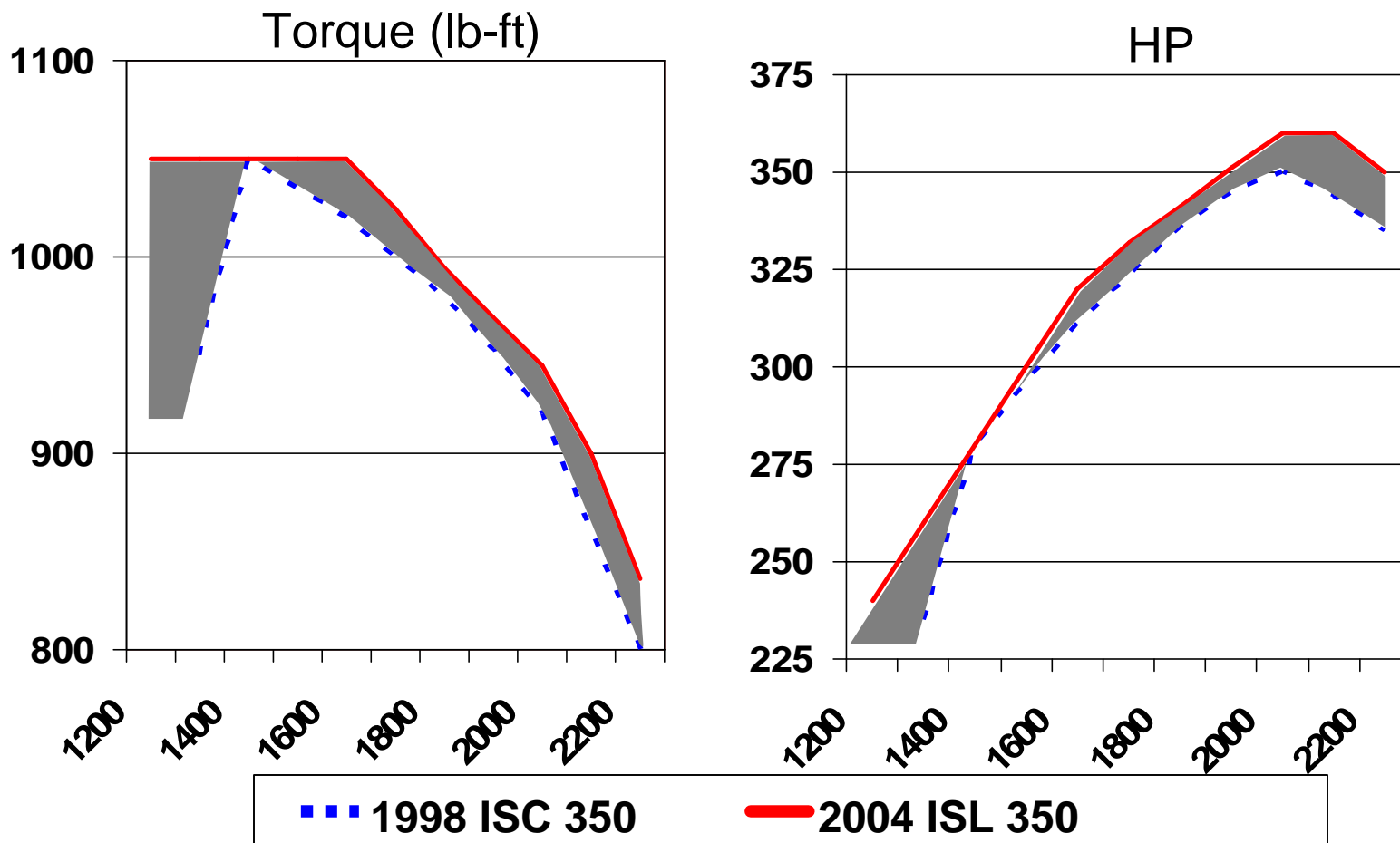


***Gas delivers maximum power at higher engine speeds ...
beyond normal operation range***



Advertised HP vs. Performance

ISL 350 delivers more performance than ISC 350





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Fuel Economy ... The 'Basics'

- Components of Fuel Economy:
 - Engine Efficiency ... Fuel required to produce a unit of Power (lb/hp-hr)
 - Power Demanded:
 - Aerodynamic
 - Rolling Resistance
 - Accessory Loses



Driver Influence ...

Engine Efficiency

- Diesel engines are more efficient at lower engine speeds (RPM):
- Maximize use of 'Top Gear'
 - Allow engine to lug-back while climbing grades ... limit unnecessary down-shifts
 - Utilize Allison 'Economy' mode ... lowers the shift point (RPM)
 - "Manage" engine speed ... limit high RPM



Fuel Economy ...

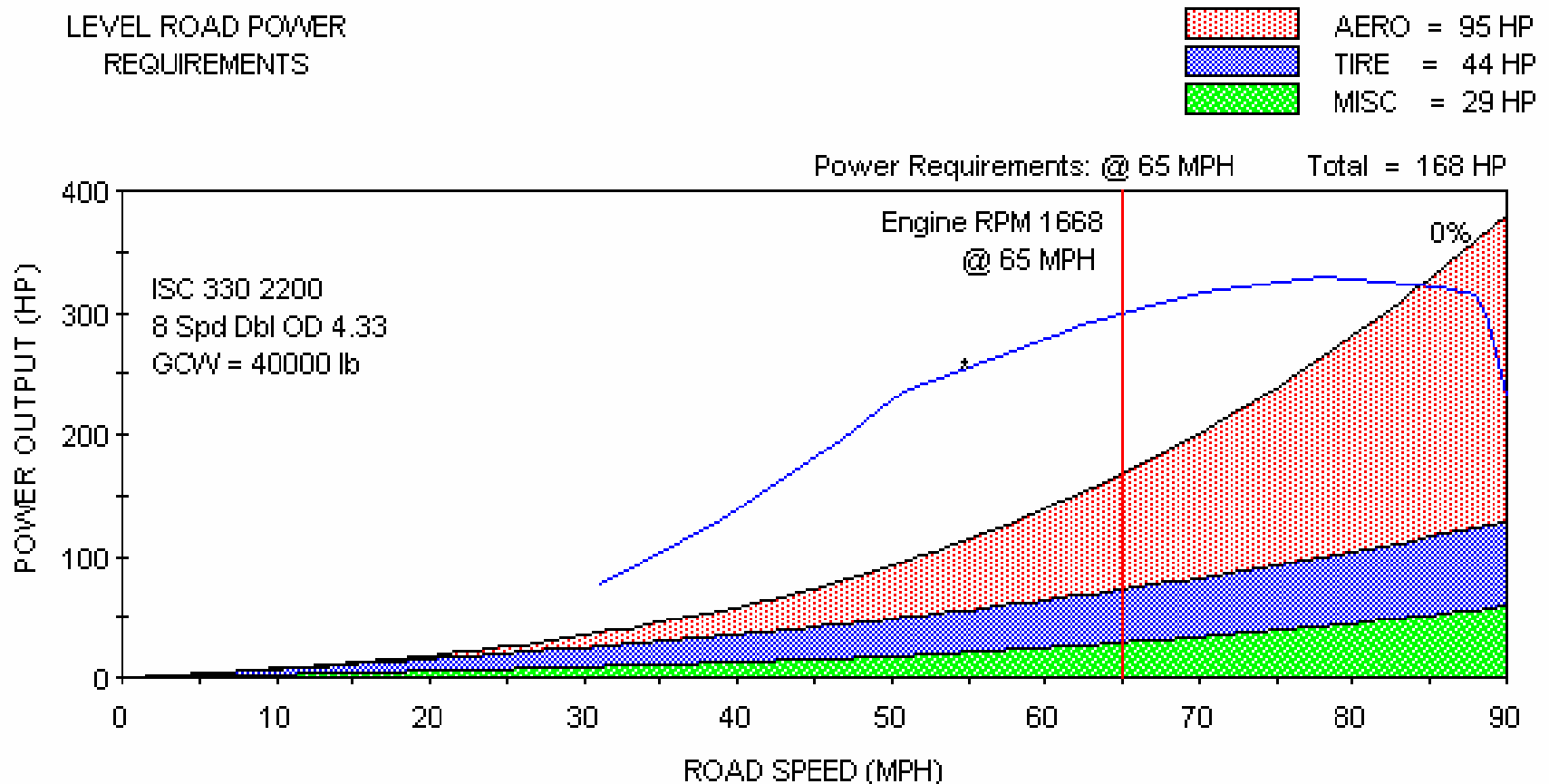
The 'Basics'

- Components of Fuel Economy:
 - Engine Efficiency ... Fuel required to produce a unit of Power (lb/hp-hr)
 - Power Demanded:
 - Aerodynamic (speed and air drag)
 - Rolling Resistance (tires/pressure, weight)
 - Accessory Loses (cooling fan, engine parasitics)

Power Demand ... Aero

Aerodynamic loses:

- Largest power demand at operating speeds*
- 'Cubic' function of speed (2x speed = 8x hp)*



Power Demand ... Speed

@ 65 = 168 hp

Aero = 95 hp

Tire = 44 hp

Misc = 29 hp

@ 75 = 238 hp

Aero = 146 hp

Tire = 53 hp

Misc = 39 hp

70 hp

51 hp

9 hp

10 hp

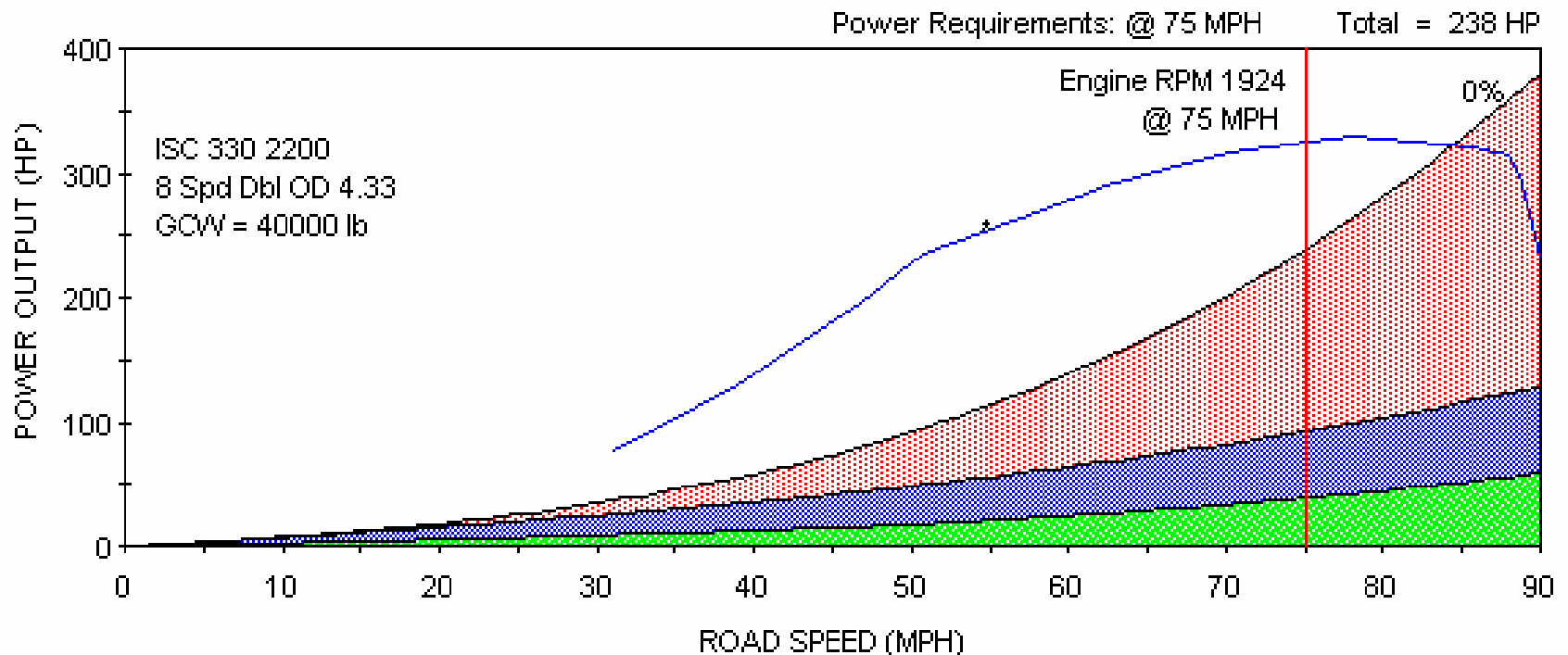
42%

54%

20%

34%

LEVEL ROAD POWER
REQUIREMENTS





Driver Influence ...

Power Demand

- The #1 factor affecting MPG is speed ...
'Rule of Thumb' **1 mpg per 10 mph**
- Maintain proper tire pressure
 - Rolling resistance increases as pressure drops
 - Low pressure results in loss MPG ... approximately 1% per 5 PSI
- Avoid excessive manual fan usage ...
cooling fans draw 20-40 hp.
- Limit unnecessary engine idling



Fuel Economy ...

Winter Losses

- Why does MPG go south for the winter?
 - Loss of energy content (winter fuel)
 - #2 Diesel = 142,000 BTU
 - #1 Diesel = 134,000 BTU
 - Gasoline = 120,000 BTU (reference point)
 - Increased air and rolling resistance
 - Cold air more dense
 - Snow, slush, or wet road surfaces
 - Lower operating temps of tires
 - Transmission and axles fluids operate below optimum temperature



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2004 thru 2009 Product Line

Cummins will continue to offer the motorhome market a complete product line-up (300 to 600 hp)

ISB

ISC

ISL

ISM

ISX



2004 Changes



(300 Hp)

Same product in '04



(315-330 Hp)

350 hp rating moved to ISL, new fuel system ... up to 50% quieter, more responsive



(350-400 Hp)

New fuel system ... quieter, more responsive, stronger engine brake.



(450-500 Hp)

New 500 hp / 1550 lb-ft rating



(525/600 Hp)

600hp / 1850 lb-ft rating introduced



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Suggested information to be kept with the Motorhome

Power Assist Brochure:
800 phone number for
service locations and
emergency assistance

Maintenance and
operation quick
reference card

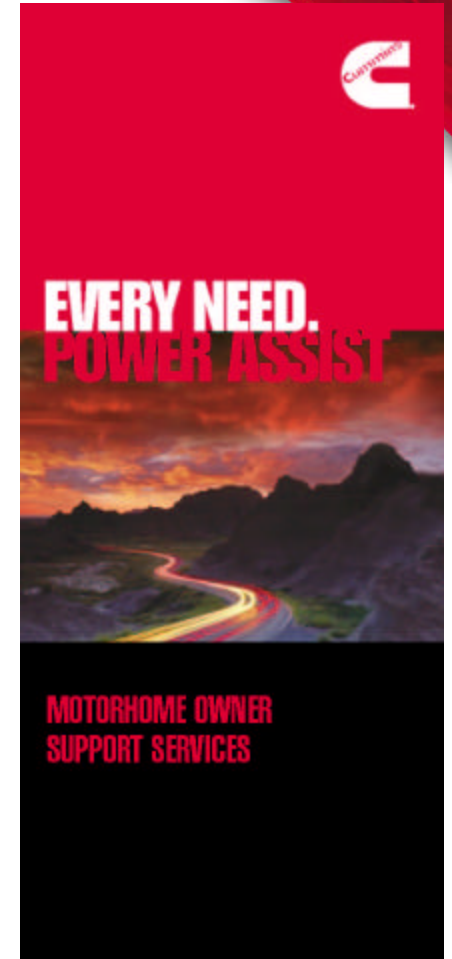
Owners Manual: Record
important information
such as engine serial
number, vehicle VIN,
special part numbers.





Cummins Power Assist

- Exclusive toll free number for RV owners ...1-888-POWER-RV (1-888-769-3778)
- 24/7/365 Emergency Assistance
- Dedicated staff of experts:
 - Gets the coach to the nearest authorized service facility
 - Help diagnose the problem
 - Manage the service event and keep the customer informed





QuickServe

- Program to accelerates problem diagnosis and improves repair times:
 - Available **only** at participating Cummins Distributor repair locations ... use 1-888-Power-RV to find participating locations
 - “When you need it fast, we guarantee that Cummins engine work with a standard repair time of four hours or less will be completed that **same day.**”

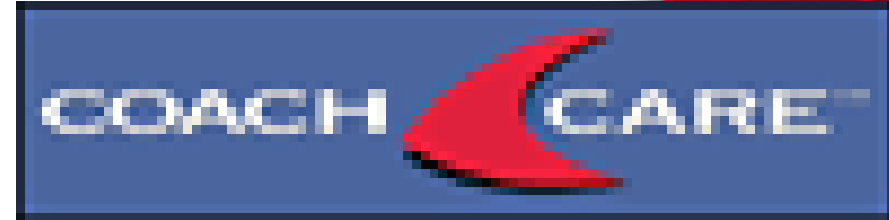


24 / 7 / 365 Accessibility

- Access to Cummins for service assistance or product information:
 - 1-888-POWER-RV (888-769-3778)
 - 1-800-Diesels (800-343-7357)
 - www.cummins.com
 - powermaster@cummins.com
 - Cummins Distributor Offices



Coach Care



- Nationwide Locations
 - (30) current locations
 - (3) new sites being added in 2005
 - Potential future sites have been identified
- Comprehensive service and repairs for RV
- Campsites for overnight stays
- Check it out at www.funroads.com



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Uprating Engine Horsepower

- Cummins engines are offered at a variety of horsepower ratings.
- Check with your RV manufacturer if uprating your engine is acceptable for your model.
- Cummins is not responsible for failures resulting from the use of parts not approved by Cummins.
- No aftermarket performance enhancement kits are approved by Cummins



Idling at Startup or Shutdown

- At Startup
 - Extended idling not required
 - Ensure oil pressure
 - Don't operate at full road speed until engine temp reaches approximately 150 deg.F.
- At Shutdown ... Idle (3-5 min) required only after full throttle / high power operation.
- Idling is not necessary after normal operation such as exiting highway, driving into rest stop, campground, etc.



Fuel Additives

- Cummins does not recommend the use of any fuel additives.
- When parking your vehicle for an extended period of time, the best defense against fungus growth is to top-off fuel tank.
- If you are in an area where you have a strong concern about fungal growth, biocide treatment wouldn't hurt.
- Purchase fuel at well respected truck stops ... move a lot of fuel daily.



Engine Oils

- Use a good name brand multi-grade oil ... consult Owner's Manual for specifications
- Synthetic oils are OK to use provided they meet the performance & chemical requirements.
- Consult Owner's Manual for specific oil and filter change intervals.
- Synthetic oils cannot be used to extend oil change interval.



Engine Coolant

- Use a 50/50 mix of water and low silicate antifreeze ... ethylene glycol or propylene glycol are acceptable
- Supplemental coolant additives are required for all Cummins engines except the ISB
- Follow maintenance requirements listed in the Owner's Manual.
- Extended life coolants are acceptable ... Follow the proper recipe



Helpful Web Links

www.cummins.com

www.everytime.cummins.com

www.funroads.com