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*Welcome to Motor Coach Industries  
Webinar Series*

*Your Webinar Will Begin Shortly*

Today's Topic:

Improving Your Fuel Economy



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# Overview

- There are many factors that affect the fuel efficiency of your motorcoach. This Webinar will identify several areas which the Operator can investigate to determine if their operations could improve and realize substantial savings in their business
- The key to increasing fuel economy should not be focused on one particular area but every aspect of coach operation
- Proper maintenance cannot be over emphasized!

# Impact on the Bottom Line

- Fuel cost increases have been devastating
- Numbers below demonstrate potential savings per coach

100,000	Miles per year
6	MPG
\$41,667	\$2.50 per gallon
\$833	2% increase in fuel economy savings
\$2,083	5% increase in fuel economy

65,000	Miles per year
6	MPG
\$27,083	\$2.50 per gallon
\$542.00	2% increase in fuel economy savings
\$1,354	5% increase in fuel economy

# *Factors Affecting Fuel Economy*

- Operating the coach
- Drive train
- Rolling resistance
- Weight
- Miscellaneous information



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## *Operating the Coach*



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# Potential Issues

Driver attitude and skill has been shown to impact fuel economy by as much as 30%

- **Fast starts and hard braking**
  - With electronic throttles, it is a common practice to press the throttle all the way to the floor
- **Speed**
  - For every mile per hour over 55 mph, the reduction of fuel economy will be approximately .1 mpg
  - 65 mph verses 75 mph would be an increase of 1 mpg
    - That is @ 15% increase
  - 55 mph verses 75 mph would equate to an increase of 2 mpg
    - That is @ 25% increase

# *Potential Issues*

- **Unnecessary idling**
  - Average motorcoach idles @ 45% of the time
  - Every hour of idle time = 1 gallon of fuel
  - Sources: cleaning, shop repairs, driver, weather
- **Lack of cruise control usage**
  - Puts the engine computer in charge of speed control
  - Smooths out rpm changes

# *Potential Issues*

- **Morning warm ups**
  - Running the engine for a long time before the coach leaves
  - Not using the auxiliary heater
- **Engine RPM**
  - The higher the RPM, the more fuel burnt
  - Every engine has a sweet spot for economy

# Potential Issues

- **A/C usage**
  - Operating the air conditioning when not necessary
  - Very difficult to control
  - A/C compressor and charging system places a heavy load on the engine and thus burns fuel
- **Unnecessary mileage**
  - Using coaches instead of cars for errands
  - Deviation from billed route

# *Possible Solutions*

- **Driver, technician training and awareness**
- **Driving simulator usage**
- **Driver monitoring systems**
- **Driver fuel economy incentive program**
- **Establish company policy on speed and idling**
- **Reprogram engine ECM to a lower top speed**

# *Possible Solutions*

- **Accurately track fuel economy**
  - Track by fleet average
  - Track by individual coach
  - Track by individual driver
  - Utilize available technology
    - Road Relay system that is basic on E Model coaches and a special option on J Model coaches
    - Trip Master system, Engine Software, Maintenance Software, manual fuel sheets

# *Possible Solutions*

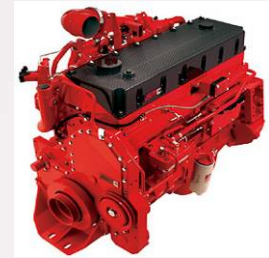
- Use shore power for cleaning buses
- Creative thinking on interior temperature conditioning
- Usage of idle management function in engine ECM
- Cruise control usage
- Pull down shades when the coach is parked

# *Possible Solutions*

- **Ensure auxiliary heaters are functional**
- **Train drivers to operate engine in the “sweet spot” range. Typically in the 1200 – 1400 rpm range**
- **Operate A/C only when needed**
- **Avoid turning the thermostat down too low**
- **Proper maintenance of A/C system**
- **Reduce non revenue miles**

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## *Drive Trains*



Cummins ISM  
(10.8 L up to 450 hp)



CAT C13  
(12.5 L up to 430 hp)



DDC Series 60  
(14 L up to 445 hp)



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# *Drive Train - Performance*

- **Ensure the engine is always operating properly**
- **Properly using the transmission gear range for the condition**
- **Rear axle gear ratios**
- **Contact your Engine Manufacturer periodically to see if there are any software updates that could improve fuel economy**

# *Possible Solutions - Performance*

- **Engine**

- **Use the proper grade of oil for your engine**
  - The thicker the oil, the more internal resistance
- **Adjust your valves on regular intervals**
  - Misadjusted valves will affect air fuel mixture and reduce proper fuel burn
- **Change the oil filter at proper intervals**
  - Dirty oil creates internal resistance
  - Utilize an oil analysis program
- **Replace air filter at proper intervals**
  - Impact can be as high as 10%
  - Do not simply blow out the filter; replace it

# *Possible Solutions - Maintenance*

- **Use only quality filters**
  - Poor quality filters will pass contaminants and thicken the oil
- **Maintain correct belt alignment**
  - Misaligned belts requires more horsepower to do their job
- **Ensure belts are in good condition**
  - Glazed belts will increase slippage and require clutch fans and A/C compressors to reduce efficiency
- **Ensure idler pulley bearings are in good condition**
  - A bearing that is dragging requires more horsepower

# *Possible Solutions - Maintenance*

- **Transmission**

- **Ensure drivers are properly trained on the operation of the transmission**
- **Use synthetic lubricants**
  - **Synthetic lubricants have more stable viscosity levels and thus more stable efficiency**

- **Rear axle**

- **Utilize synthetic lubricants**

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*Rolling Resistance*



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# *Rolling Resistance - Maintenance*

- **Tire wear**

- New tires offer more rolling resistance than used tires
- Consider staggering replacement of tires by doing an axle at a time

- **Tire quality and construction**

- Low profile tires offer better fuel economy but less life
- Different rubber compounds affect rolling resistance
- Estimated impact @1 – 2%

# *Rolling Resistance - Maintenance*

- **Tire pressures**

- 10 psi under inflated tires impacts fuel economy by 1%
- High tire temperature accelerates wear and offers more resistance
- Nitrogen is being experimented with in some fleets
  - Supposedly runs cooler than air
  - Supposedly leaks less than air
- Utilize SmarTire and Smart Wave systems

# *Rolling Resistance - Maintenance*

- **Wheel bearings and preload**
  - Worn bearings
  - Improper preload
  - Use synthetic lubricants
- **Brakes**
  - Brake pads or shoes dragging
    - Replace brake springs at each reline
    - Inspect braking surfaces for blue coloring
    - Check to ensure calipers are not binding
    - Lubricate anchor pins thoroughly

# *Rolling Resistance - Maintenance*

- **Wheel alignment**
  - 3 axle alignment is critical!!
  - Perform at regular intervals
  - Toe in is no longer good enough
- **Body damage**
  - Affects the aerodynamics of the coach
  - Bumpers and bumperettes
    - Replace as needed
    - Adjust pieces to prevent gaps

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*Weight*



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# *Weight*

- Customer has a limited ability to control this on a coach
- MCI strives to reduce the weight of the coach through engineering and product development
  - Examples:
    - Aluminum Rims
    - Multiplex Electrical Systems
    - Advanced Frame Designs
    - Composites

*Miscellaneous Information*



# *Miscellaneous Information*

- **Air leaks cause the air compressor to run more frequently putting more load on the engine**
- **Dirty radiators and improperly maintained cooling system cause the cooling fan to come on more frequently putting more load on the engine**
- **Bio diesel B20 does have a 1 to 2% negative impact on fuel economy according EPA**

## *Miscellaneous Information*

- Track your MPG per coach closely to identify possible maintenance issues quickly
- Cold weather negatively impacts fuel economy
  - 70 degrees to 24 degrees equated to @ 13%
- Changing from Diesel #2 to winter fuel negatively impacts fuel economy by @ 3%