



Locomotive Idle Reduction Options

NOVEMBER 2011

Tom Balon
(603) 647-5746 x 101
tbalon@mjbradley.com

MJB & A

MJB & A

M.J. Bradley & Associates LLC
(978) 369 5533 / www.mjbradley.com

LOCOMOTIVE IDLE MINIMIZATION

Idle Technologies

- Automatic Engine Stop/Start (AESS)
 - Fuel Operated Heaters (FOH)
- Auxiliary Power Units (APUs)
- Shore Power Plug-In Jacket Water Heaters (JWH)



“Genset” Locomotives (and Other)

Goals and Impacts Include

- Fuel Savings +
- Emission Savings +
- Reduced Noise +
- Maintenance Cost (+ or -)
 - Reduced main engine hrs +
 - Idle unit maintenance -
 - Locomotive starters -



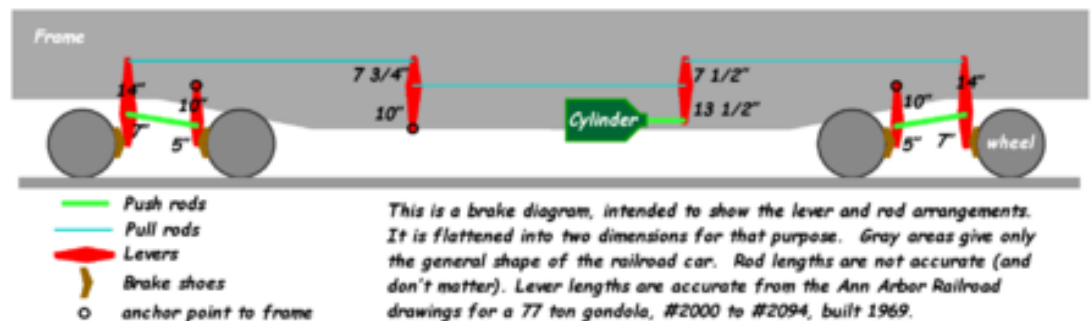
LOCOMOTIVE ESSENTIAL NEEDS

Monitored parameters:

- Air pressure (Brake Engagement)
 - Air loss on train cars triggers inspection, safety first
 - Locomotives do have manual brakes, but not train cars
- Battery voltage (engine restart, cab signal, etc.), maintenance important
- Engine coolant (its just water and corrosion inhibitor not glycol) minimum temperature (prevent cooling system dump @ 40 F)

Unique to Passenger Rail:

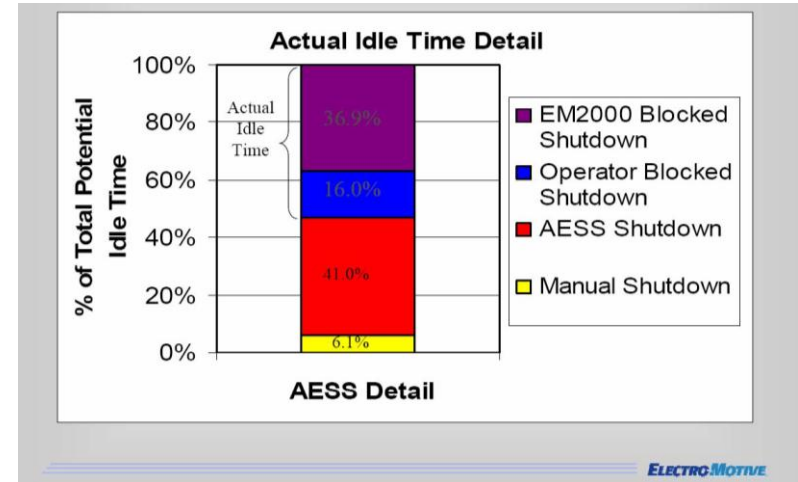
- HVAC - Commuter Rail Passenger Cars, normally HEP derived power



AUTOMATIC ENGINE STOP/START (AESS)

Advantages:

- Easy to integrate, can be used alone or in combination with other idle measures
- Small space required
- Monitors time (30 min), air pressure, battery volts and temperature(s)
- **Effective above 35 F**



Disadvantages:

- Can be overridden by operator when idle is “necessary”
- **Will not reduce idle if ambient temperature is below 25 F**
- Potential damage risk to main engine due to unattended starts
- Additional wear on main engine starters (EMD only)

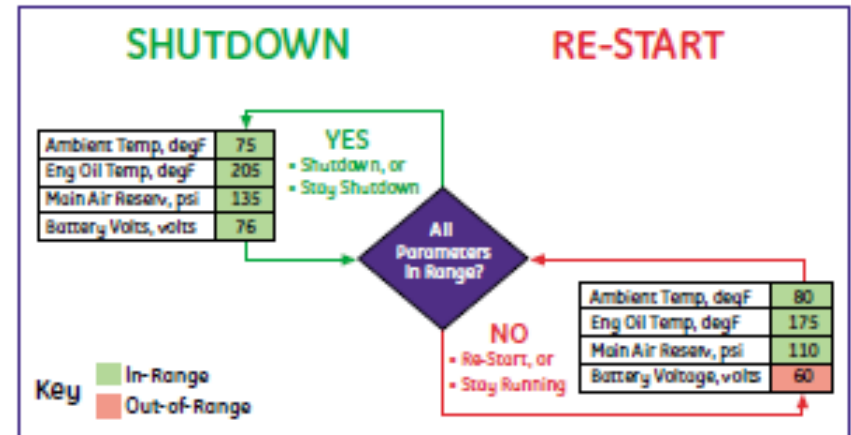
GE TRANSPORTATION'S AESS

Automatic Shut-Down Considered After:

- 10-30 minutes idling and
- Ambient temperatures > 35 F and
- Adequate brake cylinder pressure maintained

Automatic Start-up Triggered By:

- Operator reverser handle command or
- Brake cylinder < minimum pressure or
- Battery < minimum voltage or
- Ambient temperature < 25 F



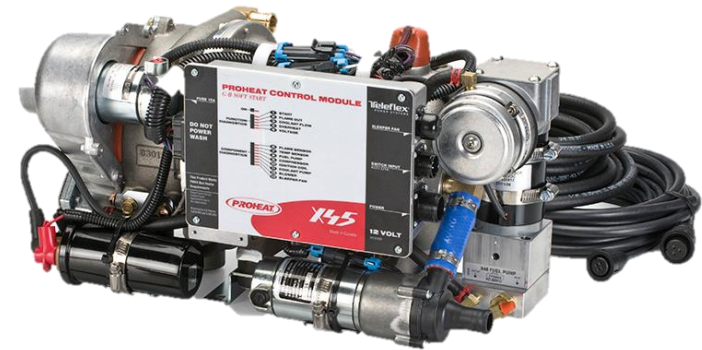
FUEL OPERATED HEATER (FOH)

Advantages

- Modest space required
- Provides warming of main engine jacket water and/or lube oil
- Uses fuel from main engine tank and uses fuel more efficiently than APUs for heating
- **Effective in Winter, not typically used in Summer**

Disadvantages

- **System requires AESS or manual start**
- Air pressure may still require main engine start
- Requires modest 120V plug-in connection or battery draw to operate
- If battery powered, AESS may restart locomotive to maintain voltage despite being warm



DIESEL AUXILIARY POWER UNIT (APU)

Advantages

- Can cycle on/off automatically
- Can provide battery charging
- Coolant/Oil heating for main engine
- Can run small electric air compressor
- **Effective in Winter, can completely prevent main engine starts**



Disadvantages

- Has a large footprint
- Requires additional fuel and electrical connections
- **Can still be noisy (albeit at higher sound frequency than main engine)**
- **Can be expensive to maintain**

SHORE POWER PLUG-IN JACKET WATER HEATER (JWH)

Advantages

- Small space required on locomotive
- Provides warming of main engine jacket water
- Typically uses natural circulation rather than pumps
- Can be combined with battery charger to maintain locomotive batteries and ground air to maintain brake pressure
- **Effective in Winter and summer, prevents main engine starts**

Disadvantages

- Must manually shutdown main engine and plug in, operator intervention
- **Requires more expensive, substantial 240V/480V Shore Power plug-in** connection to operate, which relegates its use to a dedicated parking location but logical if Shore Power is required for passenger car HVAC



EPA SMARTWAY VERIFIED PRODUCTS

APU

Kim Hotstart

PowerDrives, Inc.

IMPCO Ecotrans

FOH*

A.S.T. Group
(requires AESS)

AESS

GE Transportation

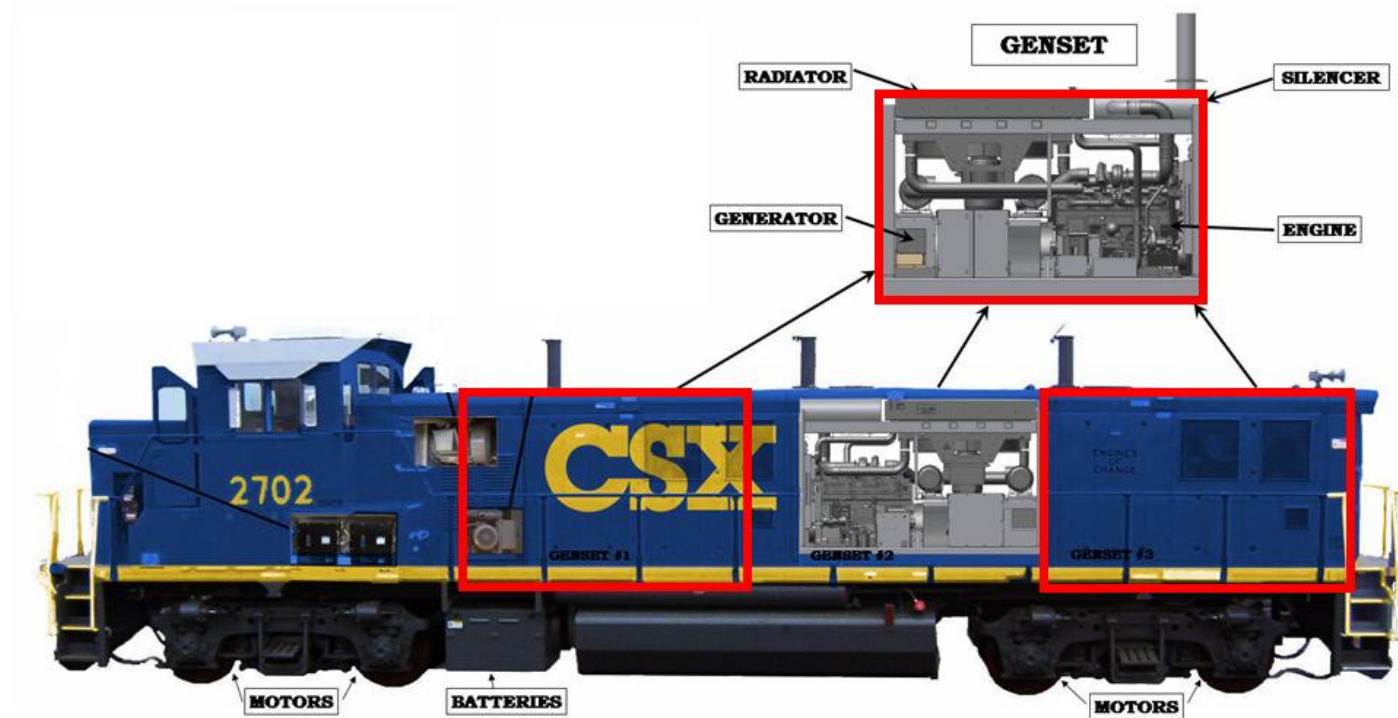
Motive Power

ZTR Control Systems

**Kim Hotstart and PowerDrives, Inc. offer FOH's, however they are not verified by EPA under the SmartWay Program*



“GENSET” LOCOMOTIVE



- Integration of AESS and large “APU” engines, (1 gal/hr vs. 4 gal/hr idle)
- Can facilitate the use of DPF equipped Interim Tier 4 non-road engines
- Non-road engines use Glycol coolant, do not need to be “warm”
- Potential for significant fuel and emission savings
- Decreased noise levels, when off and when operating, DPF’s are mufflers

OTHER WAYS TO ACCOMPLISH THE GOAL

Switcher Locomotive ← 2,300 HP → Line Haul

Mother Slug

- “Mother” locomotive produces electricity
- Transfers power to second “skeleton” locomotive for added tractive effort
- Can cut fuel consumption by 1/3 (compared to two regular locomotives)



Other Possible “Genset” Configurations

Two Engine

- 2 Small 700 HP Switcher
- 1 Small 500 HP, 1 Large 1,800 HP Switcher

Single Engine

- 1 Large 2,200 HP Switch Locomotive/Non-Road engine
- 1 Large 2,305 HP Line-Haul Locomotive/Non-Road engine