

CSX / ECOTRANS K9 APU Locomotive Application



PURPOSE

DESCRIPTION

EMISSIONS

BENEFITS

AWARDS

PURPOSE.....

The majority of the East Coast, in which CSX operates, is now a Non-Attainment Zone. Most CSX yards are in these same areas with over 50% of all Switchers and Locals.

EPA set emissions standards for new and remanufactured locomotives that took effect in Jan. 2002. CSX now required to install an emissions reduction kit on every overhauled locomotive.

The market pricing of earlier emission kits was the driving force for CSX to spend in excess of \$1M to develop and obtain EPA Certificates of Conformity for the EMD fleet.

CSX developed an Idle Reduction Strategy with an Auxiliary Power Unit, APU, as the platform to help reduce emissions and save fuel.

PURPOSE.....

WHY focus on Idle?

Railroads idle locomotives to protect the main engine in cold weather, (hard-to-start, no anti-freeze, leaks, cab heat, etc).

Locomotive engines are very inefficient at idle, (4-5 gphr), compared to the APU, (0.4 gphr @ 6kW).

APU's reduce all emissions and conserve fuel by shutting down the main engine at idle regardless of weather conditions or operating location.

16% of Switcher Locomotive weighted Nox emissions occur at idle, (60% idle reduction = 10% Nox reduction).

DESCRIPTION.....



The APU uses a Kubota diesel engine genset that consists of a 48 HP, 1800 rpm, 4 cylinder turbocharged engine that produces 17 kW, 240/120vac, 60Hz power.

This patented system protects the main locomotive engine during shutdown times by monitoring and maintaining the lube oil and water temperatures.

DESCRIPTION.....



CSX currently has 1400 locomotives with APUs installed, with 150 Switchers planned for 2004, (all EMD locomotives to be completed by 2006).

APU serves as the platform for 120vac cab appliances, for cost effective air conditioning, heating, (both cab and toilet areas), lighting and security, and communication devices.

EMISSIONS.....

The Auxiliary Power Unit is part of a locomotive Tier 0 package certified to meet EPA's Locomotive rule.

The APU will serve as the foundation for future locomotive engine emissions reductions strategies.



EMISSIONS.....

The following EMD engine families have Certified Emission Reduction Kits, which include an APU

8, 12, & 16-645E

12 & 16-645E3, E3A

16-645E3B, & E3M

8 & 16-645E3C

16-645F3B

12-710G3A

16-710G3B, G3B-EC

16-710G3B-ES

20-710G3B-ES

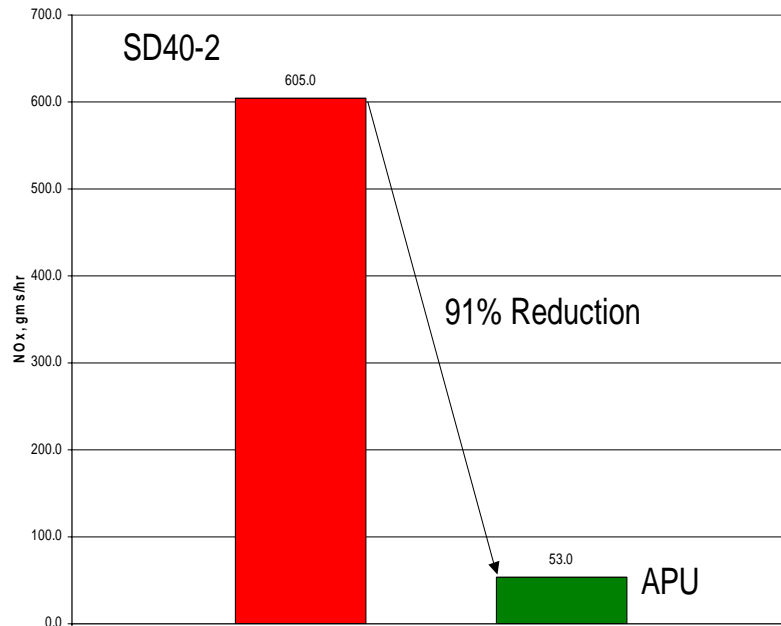


EMISSIONS

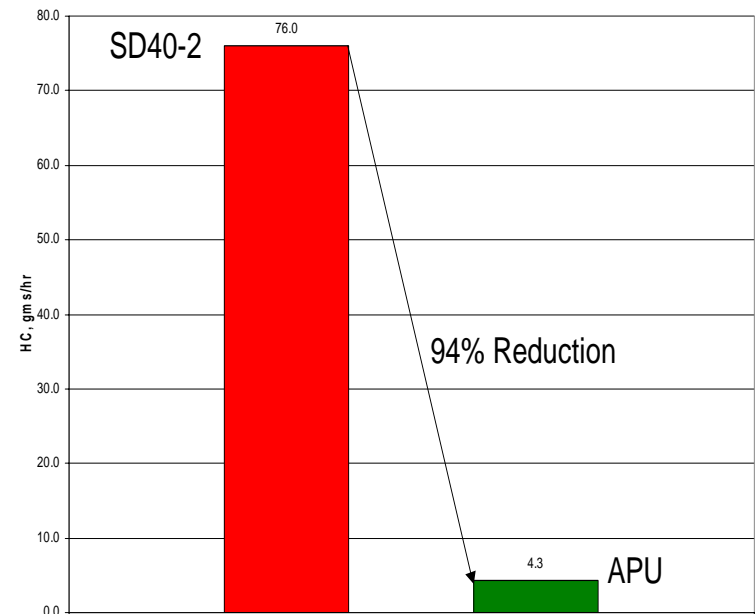
(SD40-2 16-645E3 vs APU)*

(*test data from Southwest Research Institute)

Nox Emission Rates



Hydrocarbon Emission Rates

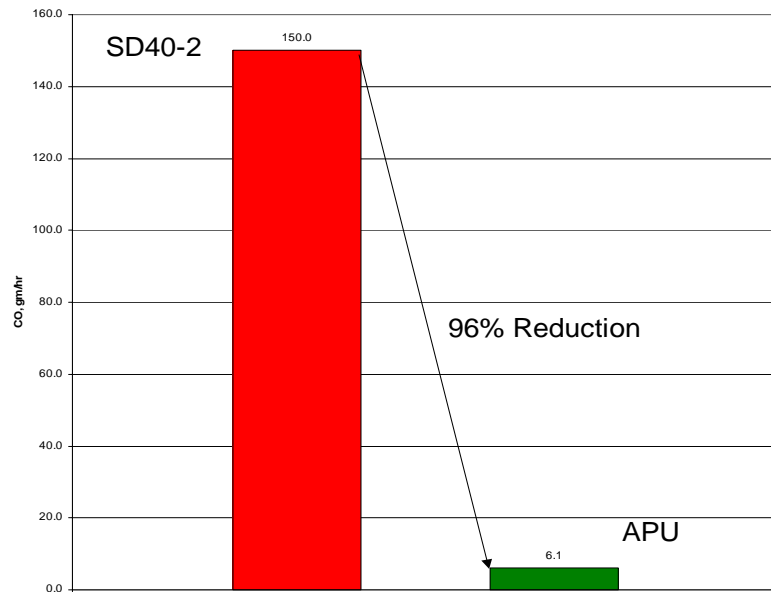


EMISSIONS

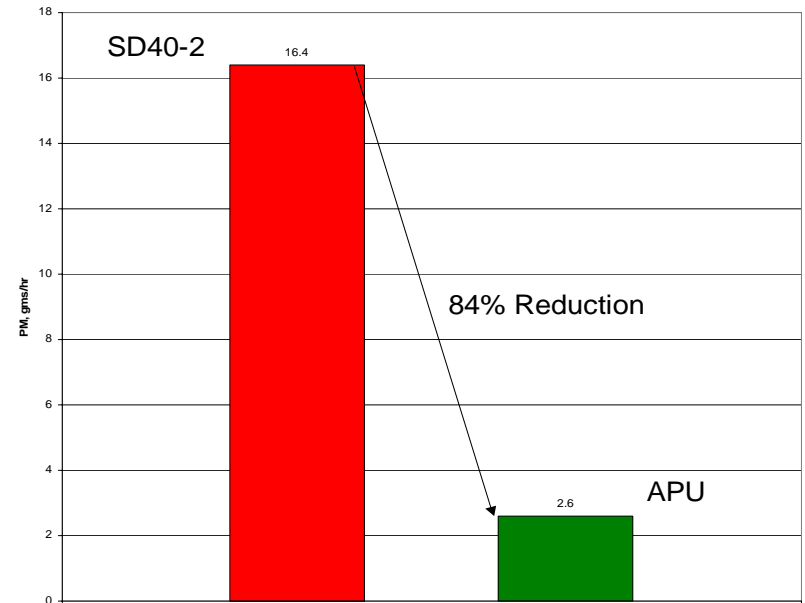
(SD40-2 16-645E3 vs APU)*

(*test data from Southwest Research Institute)

Carbon Monoxide Emission Rates



Particulate Matter Emission Rates



BENEFITS

Fuel Consumption Reduction

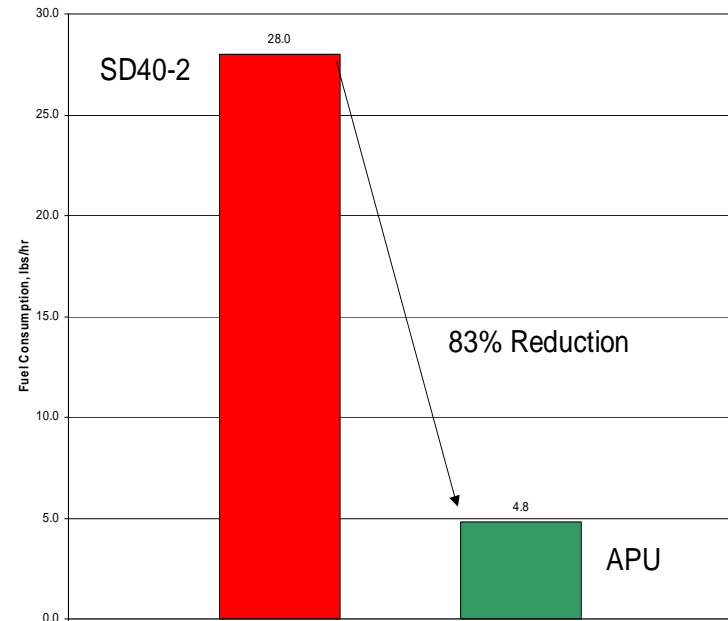
APU reduces Idle fuel consumption by 83%

CSX roughly burns 1.5 million gallons of diesel fuel per day, (450 million gallons/year) with 3600 locomotives.

For some Switcher locomotive applications, (when left to operate as designed), 83% equates to over 20,000 gallons/year.

Independent SwRI test on two BNSF locomotives, demonstrated an avg. fuel reduction of 22,000 gallons.

If 50% of this reduction were achieved, at \$1.00/gallon, CSX would save \$36 million/year.

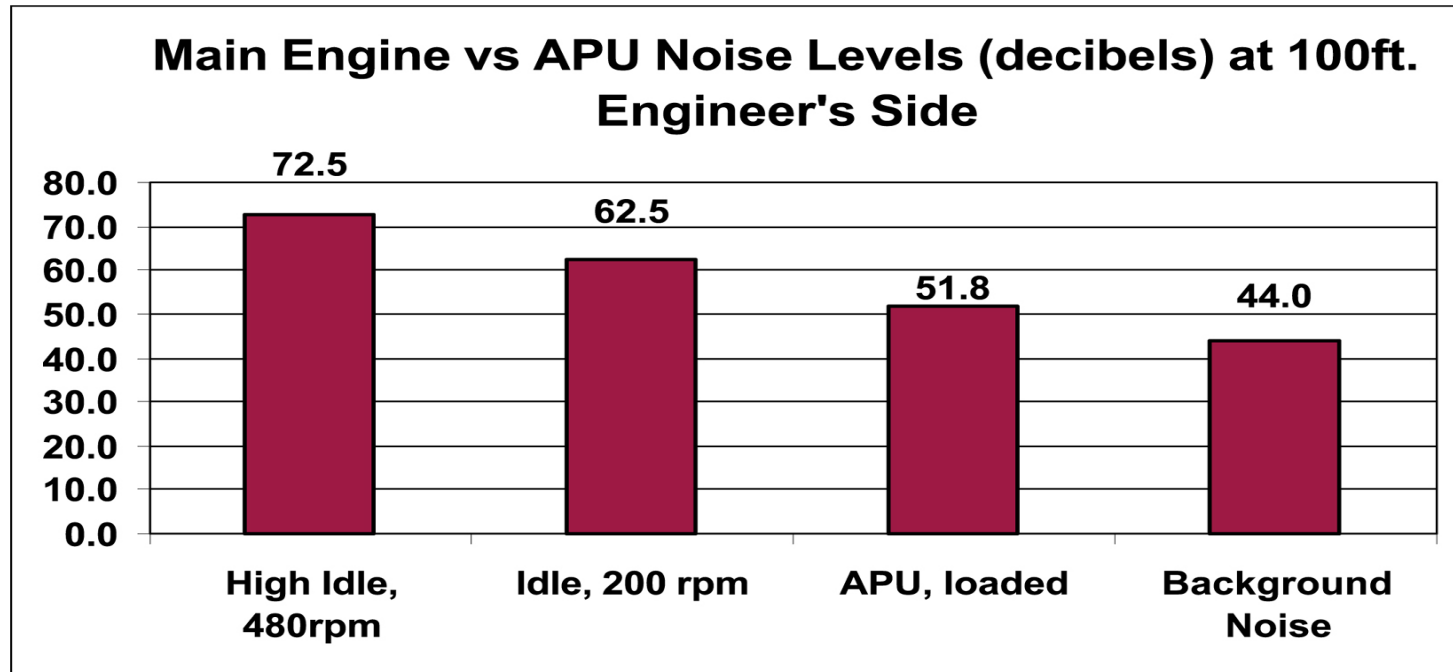


(SD40-2 16-645E3 vs APU)*

(*test data from Southwest Research Institute)

BENEFITS.....

Noise Reduction



The noise level of the APU is roughly equivalent to normal background noise at 100 feet.

OTHER BENEFITS.....

Oil-out-the-stack, (Souping)

CSX study of GP38-2 = 1.3 gallons in 24 hours, (estimated to be app. 200 gallons/year)

Total Base Number, decreased at an estimated rate of 1 TBN per month of idling or 30-40% of the oil alkalinity per year.

Increased engine life, reduced wear

Idling is hard on liners, rings and valves

Increased lube oil life

Idling produces a high quantity of combustion acids and blow-by

Track fires – throttle sweeps on sidings

BENEFITS

SwRI Field Demonstration

A one-year, two-unit field test by SwRI funded by the Texas Emissions Reduction Plan, TERP, demonstrated avg. annual Nox reduction of 4.7 tons and fuel savings of 22,000 gals. for each test locomotive.



<https://vault.swri.org/apu/locoapu.htm>

User name: locoapu

Password: 2xAPU@SwRI

RECOGNITION

EPA

Environmental

Excellence

Award

Maryland

/D.O.E.

Grant

Award

Texas

Environmental

Excellence

Award

Ontario Global

Traders/Partnership

Southeast Region

Award

Ontario Global

Traders/Partnership

Province

Award