Argonne NATIONAL LABORATORY

IDLING REDUCTION FOR EMERGENCY VEHICLES

A Case Study

Emergency vehicles have unique power needs; they need not only propulsion power, but also power when stationary. Using a vehicle's main engine for stationary power, however, may not be the most cost-effective or environmentally friendly approach. Emergency-response agencies and departments across the U.S. are recognizing that reducing vehicle idling can reduce fuel costs, emissions, and noise while reducing maintenance intervals and extending vehicle life.

Diesel APUs helped the U.S. Air Force Civil Engineer Center reduce fuel use and engine maintenance costs in its fire-service vehicles. Used with permission of the U.S. Air Force.

An Argonne National Laboratory (Argonne) study, *Case Study: Idling Reduction Technologies for Emergency Service Vehicles* (available at http://www.anl.gov/energy-systems/publication/case-study-idle-reduction-technologies-emergency-service-vehicles), investigated the adoption of idling reduction technologies (IRTs) by nine emergency-vehicle fleets, including police, ambulance, and fire engines and trucks. The IRTs included battery auxiliary power units (APUs), diesel APUs, electrified parking spaces (EPS), and a managed engine stop/start system (Table). This fact sheet summarizes the study's findings. (A fact sheet that provides a general overview of IRTs for emergency vehicles—Idling Reduction for Emergency and Other Service Vehicles—is available at http://www.afdc.energy.gov/uploads/publication/idling_emergency-service_vehicles.pdf.)

IDLING REDUCTION TECHNOLOGIES USED BY EMERGENCY VEHICLE FLEETS IN STUDY*

FLEET TYPE	FLEET (LOCATION)	IRT TYPE**
Police	Raleigh Police Department (NC)	Lead-acid battery APU
Police	City of Dallas Police Department (TX)	Lead-acid battery APU
Police	U.S. Border Patrol (AZ)	Lithium-ion battery APU
Police	Tuscaloosa Police Department (AL)	Lithium-ion battery APU
Police	Santa Barbara County Sheriff's Office (CA)	Managed engine stop/ start system
Ambulance	Poulsbo Fire Department (WA)	Lead-acid battery APU
Ambulance	Austin-Travis County EMS (TX)	Lead-acid battery APU
Ambulance	Vermont Department of Environmental Conservation (VT)	EPS
Fire	Poulsbo Fire Department (WA)	Diesel APU
Fire	U.S. Air Force Civil Engineer Center (various)	Diesel APU

* Technologies provide electric power for emergency lights and communications and other equipment; some technologies also enable the use of heat or air conditioning or both.

** APU = auxiliary power unit; EPS = electrified parking space.

POLICE VEHICLES

Police vehicles idle while stopped to power emergency lights, computers and other communications equipment, and heating/cooling (HVAC). These systems must run even when officers step away from their vehicles. The police departments in the Argonne study tested two types of battery-powered APUs and a managed engine start/stop system. Battery APUs supply power to the vehicle's electric devices when the vehicle's engine is off and recharge when the engine is running. One police department used a managed start/stop system that shuts off the engine, draws power from the main battery to run auxiliaries, and restarts the engine when the battery's state-of-charge drops below a set threshold.

Benefits: During an 11-month test of 55 police cruisers in a temperate climate (low HVAC power needs), the managed start/stop system was calculated to save about 260 gallons of fuel per vehicle each year. The system paid for itself within 5.9 months, on average. Because capital costs were low and staff mechanics could install it, the managed start/stop system was welcomed by the police fleet that used it. The lithium-ion battery based APUs saved 1 gallon of fuel per hour and paid for themselves in less than 1 year. Fleets that transfer battery APUs from retiring vehicles to new vehicles can further increase fuel savings and improve return on investment.

Lessons Learned: Power requirements for stationary police vehicles may be greater than anticipated; two police departments found that lead-acid battery APUs ran out of power sooner than expected. The large size of these APUs also posed a problem because required police equipment already consumed much of the trunk space.

AMBULANCES

Ambulances idle while paramedics pick up or drop off patients and to keep equipment and medications at proper temperature between calls. The ambulance fleets in the Argonne study tested battery APUs and EPS. EPS kiosks provide electricity and climate control (via a duct that attaches to a vehicle window) to ambulances at hospital emergency departments.

Benefits: With battery APUs, emergency-response departments saved at least $5,100 in annual fuel costs per ambulance and reduced oil changes by at least 50%. Battery APUs recouped their costs within 1.1 to 1.3 years, according to one department. EPS kiosks were located at hospital emergency departments, where ambulances often idle. Any ambulance could use EPS kiosks without spending time or money on installation. The use of these kiosks reduces emissions near emergency departments' sensitive populations.

Lessons Learned: Some drivers of ambulances with battery APUs struggled with different versions of the system, which had different operator requirements. Using the same IRT system across a fleet enables transparent operation by drivers who use different vehicles. Because neither hospitals nor ambulance fleets tracked EPS kiosk use, cost savings for this technology are not available.

FIRE ENGINES AND TRUCKS

Fire engines and trucks idle on the scene of fire and medical emergencies from 30 minutes to an hour or more. All fire departments in the Argonne study used diesel APUs, which draw fuel from the main tank, to reduce idling. Like battery APUs, diesel APUs power a vehicle's electrical load when the vehicle engine is off.

Benefits: Diesel APUs use about 80% less fuel than idling the engine and can provide nearly uninterrupted power for long periods. These APUs displaced 700 to 1,000 idling hours (saving $1,750 to $2,500 at a fuel cost of $2.50/gallon) per vehicle each year. Because of the reduced engine-on time, the system reduces maintenance costs with fewer oil changes and engine repairs.

Lessons Learned: Installing diesel APUs on existing fire trucks and engines may be expensive, and the return on investment may be long, especially if reduced maintenance costs and extended engine life are not factored in. However, upgrading APUs so that they engage automatically (require no operator input) is inexpensive and leads to a quick return on investment.

CONCLUSIONS

- Emergency-response fleets using IRTs not only save on fuel costs, but also reduce maintenance costs, emissions, and noise. Reduced engine wear means longer vehicle life.
- IRT systems need to be well matched to the fleet's stationary power needs; HVAC needs will vary with region.
- Fleets that use a single generation of a fully developed IRT system have better driver acceptance and less driver confusion than fleets using various systems or various generations of a system, which maximizes return on investment.
- Smaller, lighter, and lower-cost battery APUs with longer battery run times and useful lifetimes will accelerate adoption. This is especially true for police cruisers, which have less available space and consume less fuel while idling than larger emergency-response vehicles.

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