

Idle Reduction Technologies Available from the Factory

January 2020

At a Glance

Idle reduction technologies (IRTs) are technologies that reduce fuel consumption and fuel costs. Initially, these devices were sold as aftermarket add-ons to vehicles, especially police vehicles. Though the aftermarket add-ons are effective and have been implemented in several large cities, more recent technological developments from vehicle manufacturers may have made aftermarket IRTs for non-hybrid vehicles unnecessary in most applications. For the Police Department, staff recommends implementing the purchase of hybrid vehicles with IRTs as vehicles are replaced, when appropriate, rather than purchasing aftermarket IRTs that would have to be quickly phased out of the fleet as vehicles are replaced. Hybrid vehicles with IRTs have a higher initial cost, but show a higher reduction in fuel consumption and cost than aftermarket IRTs added to a non-hybrid vehicle. For the Fire Department, a few fire apparatus in the City have diesel generators that help reduce fuel consumption, but they do not power for all equipment, including air conditioning and heating. Adding a diesel generator to fire apparatus would be cost-prohibitive. However, staff recommends continuing to purchase fire apparatus with diesel generators when appropriate.

Scope

Professor Emeritus William Rua met with council members, the city manager, and the Public Works director to discuss, among other topics, anti-idling technologies, which are commonly known as IRTs. The city manager directed staff to research the feasibility of these technologies to reduce fuel consumption and fuel costs. Staff's research is independent of Rua's initial findings, but builds on the information he provided, such as providing an update to the IRT efforts in Columbus, Ohio.

Background

Fleet Management continues to follow Strategic Plan and Comprehensive Plan goals to consider ways to "green the fleet" in responsible and practical matters. The City's Strategic Plan specifically calls for the incorporation of "green sustainable" concepts into the City's development and plans. In addition, the City's Comprehensive Plan includes the goal and objective to reduce air pollutants and other impacts produced by transportation, which includes ongoing reductions in greenhouse gas emissions from transportation sources.

Based on the most recent calculations, the city has 191 vehicles that run on alternative fuel, including 6 hybrid vehicles. In addition to these measures, The City has an existing citywide anti-idling policy, and the Police Department and Fire Department each have internal anti-idling policies. However, these policies rely on compliance and knowledge of the specifics of the anti-idling policy in order to comply. This is not to say that the policies are ineffective, but IRTs, especially on hybrid vehicles, are an additional, easy way to prevent unnecessary idling.

Findings

Descriptions of Idle Reduction Technologies

Much of the information in this section is found in a 2016 case study by Russel J. Owens and Michael D. Laughlin titled "Case Study - Idling Reduction Technologies for Emergency Service Vehicles." Additional information for each IRT (apart from engine control unit modifications), as well as information from individual agencies that have used each system, are available in this study. The study provides further insight that is not provided in the memorandum and is recommended for further reading. Although the study was written prior to the introduction of factory battery auxiliary power units, much of the information is useful for background information. Out of these options, staff recommends implementing factory battery auxiliary power units, which are available on hybrid vehicles, to reduce idling in police and other patrol vehicles that frequently idle as a requirement to keep electrical equipment running.

Benefits of IRTs¹

- Reduce emissions and improve air quality for neighborhoods and those on the scene
- Reduce noise pollution to keep neighborhoods quieter and make communication easier
- Reduce operating costs and improve vehicle life
- Reduce fuel usage and cost
- Units may be able to pay for themselves, depending on system, savings, and battery costs

Common Types of IRTs¹

- Battery auxiliary power unit (APU)
- Diesel combustion engine APU
- Managed engine stop/start system
- Electrified parking spaces (EPS)
- Engine control unit (ECU) modifications

Another type of IRT, which is similar to a managed engine stop/start system, is an automatic shutoff that many passenger vehicles have that shut the engine off at a stoplight or in heavy traffic. However, this type of system does not address the issues faced by police and fire departments that may be required to have vehicles idling for an hour or more to keep equipment running. Some vehicles in the City of Bloomington use this technology.

Battery Auxiliary Power Unit¹

- Bank of deep-cycle batteries and a controller to manage the use of stored energy
- Either always engaged or have to be manually engaged
- Power electrical loads (i.e. emergency lights, interior lights, onboard electronic equipment, and sometimes HVAC) for the vehicle and attached equipment
- May be charged with stored energy and/or grid electrical power
- Multiple manufacturers for aftermarket applications including Stealth Power, ZeroRPM, and GRIP
- Aftermarket batteries may need to be replaced every 2-3 years
- Available from the factory for the 2020 Ford Police Interceptor Utility Hybrid SUV
- Most prevalent IRT chosen for police vehicles and ambulances
- Not available for firetrucks at this time

Columbus, Ohio Results²

In 2014, the City of Columbus, Ohio began using a battery APU, known as GRIP Idle Management (GRIP), on approximately 300 new police cruisers, using state grant funds. These aftermarket devices allowed the cruisers to reduce idling and reduce fuel consumption. The technology stops and restarts a cruiser automatically without affecting the on-board power needs that are essential to operate computers and radio communications. However, with the introduction of the Ford Police Interceptor Utility hybrid, the City of Columbus began phasing out the GRIP units and purchasing the hybrids instead. Additional information is available in the "Comparing Aftermarket and Factory Battery Auxiliary Power Units."

Diesel Combustion Engine Auxiliary Power Unit¹

- Uses a diesel generator that uses fuel from the main-engine fuel tank
- Can supply electric loads directly or charge deep-cycle batteries
- Engages after a certain amount of time idling
- Power electrical loads (i.e. emergency lights, interior lights, onboard electronic equipment, and sometimes HVAC) for the vehicle and attached equipment
- If using a deep-cycle battery, can also be charged with grid electrical power
- High maintenance cost, potentially high install cost
- Not typically used for police vehicles and ambulances due to size
- Most prevalent IRT chosen for firetrucks

Electrified Parking Space¹

- Grid electrical power kiosk that provides power for electrical loads (i.e. emergency lights, interior lights, onboard electronic equipment, and sometimes HVAC) for the vehicle and attached equipment
- Drivers park next to the kiosk, connect the required power and HVAC, and then turn the vehicle engine off
- Stays operational as long as the vehicle is connected
- Only useful if vehicles park in the same location throughout the year (i.e. ambulance regularly parked at a dispatch location far from the fire station)

Managed Engine Stop/Start System¹

- Electronic controller that monitors battery charge and engine start/stop
- Some use a deep-cycle starter battery, while others ad a separate deep-cycle storage battery
- Automatically shuts down engine after vehicle is in Park and has idled for a set period of time
- Monitors battery voltage and restarts the engine when voltage drops below a define safe operating threshold, and the engine then partially recharges the battery using the alternator
- Subsequent engine shutdowns are shorter
- Electric devices powered by the battery
- Run time depends on power draw
- Low capital cost
- Easy to install

ECU Modifications^{3,4}

- Uses software to modify the vehicle's ECU to increase performance and efficiency during idling
- Vehicles still idle, but at a lower RPM, which can have some of the benefits of the other systems
- Low comparative cost
- Derive Efficiency and others sell this service
- Not as effective as other technologies

Ontario, California Results³

In June 2016, the city used Derive Efficiency to calibrate five vehicles in its fleet, identifying five additional cars as control vehicles, said Craig Grabow, fleet services manager for the city. Three of the calibrated vehicles were from the Police Department, while two were from Utilities and Parks & Maintenance. Grabow had the police vehicles — a Ford Police Interceptor Utility, a Ford Crown Victoria, and a Chevrolet Tahoe PPV — calibrated for improved performance and efficiency during idling. He had two trucks — a Ford F-150 and a Chevrolet Silverado — calibrated for high fuel efficiency as well as reduced fuel use during idling. Grabow said the vehicles in the pilot on average idle 56% of the time, and average fuel consumption is 140 gallons per month, per vehicle. Using Derive's engine optimization software, the vehicles consumed 22.5 gallons less per month on average per vehicle. Using an average cost per gallon of \$2.78, the average savings in fuel is calculated to be \$62.55 per month, or \$750.60 per year, per vehicle.

Comparing Aftermarket and Factory Battery Auxiliary Power Units

Using verified data provided by Ford Motor Company and local vendors, combined with information from GRIP, other municipalities, and local data, staff developed a table that shows a comparison between aftermarket and factory battery auxiliary power units, including price, predicted fuel consumption reduction, and predicted fuel cost reduction. The data shows that purchasing a hybrid Ford Police Interceptor Utility with IRT, with an estimated cost difference of \$3,375 from a standard Ford Police Interceptor Utility, would have a 1.2-year payback period and an annual fuel savings of 1,273 gallons or \$2,763 with the current average fuel price. To add equivalent IRT technology to a standard Ford Police Interceptor Utility would cost about \$3,000, not including installation, maintenance, or impacts to vehicle warranty, and would have a 2.2-year payback period and an annual fuel savings of 622 gallons or \$1,351 with the current average fuel price. The data shows that purchasing the hybrid Ford Police Interceptor Utility is more cost-effective and saves more gallons of fuel than adding IRT to a standard Ford Police Interceptor Utility. Additional data is found in the table on the next page.

Idle Reduction Comparison

**Ford Police Interceptor Utility 3.7L AWD
No IRT**

20,000	Miles driven per year
17	MPG-Projected EPA estimated combined rating
1176	Gallons of fuel consumed per Year

4.9	Hours idling per 8 hour shift
0.464	Gallons of fuel consumed per hour
2	Shifts per day
365	Days per year
1660	Gallons of fuel consumed per year

2,836	Total Gallons of fuel consumed per year
\$2.17	Average fuel price
\$6,155	Annual Fuel Cost

**Ford Police Interceptor Utility HEV AWD (Hybrid)
Includes IRT from Factory**

20,000	Miles driven per year
24	MPG-Projected EPA estimated combined rating
833	Gallons of fuel consumed per Year

4.9	Hours idling per 8 hour shift w/ IRT
0.204	Gallons of fuel consumed per hour*
2	Shifts per day
365	Days per year
730	Gallons of fuel consumed per year

*56% reduction in fuel consumption per manufacturer

1563	Total gallons of fuel consumed per year
\$2.17	Average fuel price†
\$3,392	Annual fuel cost
1,273	Gallons of fuel saved per year
\$2,763	Annual savings

† Based on 12-month average from monthly reports

# Years	4	5	6
Fuel Reduction	5,093	6,366	7,639
Savings	\$11,052	\$13,814	\$16,577

\$3,375	Estimated Cost
1.2	Years Payback

**Ford Police Interceptor Utility 3.7L AWD
w/ GRIP Anti-Idle System**

20,000	Miles driven per year
17	MPG-Projected EPA estimated combined rating
1176	Gallons of fuel consumed per Year

4.9	Hours idling per 8 hour shift w/ IRT
0.290	Gallons of fuel consumed per hour†
2	Shifts per day
365	Days per year
1037	Gallons of fuel consumed per year

†37.5% reduction in fuel consumption per manufacturer

2214	Total gallons of fuel consumed per year
\$2.17	Average fuel price†
\$4,804	Annual fuel cost
622	Gallons of fuel saved per year
\$1,351	Annual savings

# Years	4	5	6
Fuel Reduction	2,490	3,112	3,734
Savings	\$5,403	\$6,753	\$8,103

\$3,000	Estimated Cost‡
2.2	Years Payback

‡ Hardware cost, does not include installation, maintenance, or impacts to vehicle warranty

Recommendations

Staff recommends purchasing hybrid vehicles with IRT from the factory, when appropriate, rather than purchasing standard vehicles and adding IRT, especially for cars and SUVs that are traditionally required to run specialty equipment by idling with a vehicle running, such as some Police Department and Fire Department vehicles. This may increase the budgeted amount for each vehicle, but with a predicted payback period of about 1.2 years per vehicle, and the immediate reduction in fuel consumption and fuel costs, hybrid vehicles with IRT are the best option to keep in line with Strategic Plan and Comprehensive Plan goals as well as reduce fuel costs in the long term. For larger vehicles in the Fire Department, staff recommends continuing to purchase fire apparatus with diesel generators when appropriate.

References

¹ Owens, R. J., & Laughlin, M. D. (2016). Case Study - Idling Reduction Technologies for Emergency Service Vehicles. Argonne, Illinois.

² City of Columbus Division of Fleet Management. (2019). Green Fleet Action Plan 2019-2021, 2019 Mid-Year Update. Columbus, Ohio.

³ Government Fleet. (2019, April 5). Calif. City Reduces Fuel Use With Vehicle Calibration. Retrieved from Government Fleet: <https://www.government-fleet.com/139728/calif-city-reduces-fuel-use-with-vehicle-calibration>

⁴ Government Fleet. (2015, March 9). Police Fleet Slashes Idle Fuel Costs by 26%. Retrieved from Government Fleet: <https://www.government-fleet.com/128326/fla-police-fleet-slashes-idle-fuel-costs-by-26>