Technology Study

Engine idle management

STUDY SUMMARY

This study examines idle reduction strategies. The potential benefits of using idle reduction technologies in freight transport are discussed, as well as the key limitations and barriers. Some case study examples of effective idle reductions are also presented.

The *Green Truck Partnership* is designed to be a forum for the objective evaluation of the merits of clean vehicle technologies and fuels by heavy vehicle operators. This technology study discusses strategies for reducing engine idling.

1 ENGINE IDLE MANAGEMENT

Preventing or reducing the occurrence of engine idling reduces the amount of unnecessary fuel consumption.

Typically, vehicle engines are left to idle when drivers queue in traffic, use auxiliary equipment, load and unload goods, process paperwork, talk on the phone and, to a lesser extent, eat and sleep in the air-conditioned or heated cab.

Engine idling can be reduced by two main strategies: by training drivers to turn off the engine when not required, and by fitting devices that turn the engine off when it is idling unnecessarily.

Idle reduction is most effective for fleets that operate on urban delivery routes with frequent stops. These vehicles are exposed to conditions that involve repeated unproductive running time, accumulated over numerous small instances but leading to a significant idle period over time.

Fleet applications considered less suited for this initiative include regional freight and delivery routes that are likely to be subject to longer unloading times during which idling is not a common practice.

2 REASON TO PURSUE THIS OPPORTUNITY

Reducing the time an engine spends idling is relatively easy to achieve, without compromising the utility of the vehicle. It may require a shift in attitude, but its multiple benefits include:

- reduced fuel use (and costs and emissions)
- reduced engine wear
- reduced noise
- improved air quality (WHS) in work areas.

The main commercial benefit of reducing engine idling is that the fuel that would have been consumed while idling effectively becomes a fuel saving, with corresponding cost savings. Savings as high as 8% can be achieved across fleets for local delivery vehicles, but greater savings can be expected on construction sites, where vehicles are sometimes left idling up to two hours during lay-over.

Light commercial vehicle engines can use 2–3 L of fuel per hour idling, while prime movers use up to 4 L/h. Nominal fuel use by different sized idling engines is shown in Table 1.

As the table shows, the largest truck engines may use about twice as much fuel as the smallest ones when idling. But large trucks also use up to three to five times more fuel than a small delivery truck when driving. As a result of this, and because small truck applications involve more idling, idling fuel use is generally a greater proportion of total fuel used in smaller distribution trucks.

As a result, this initiative is considered most effective for vehicle operations characterised by frequent stopping for periods that encourage drivers to idle rather than switch engines off.

Table 1 Estimated fuel use in idling

Vehicle type	Vehicle size/class	Estimated fuel use (L/h)*
Rigid truck	2–4 t	2
Rigid truck	6–8 t	2
Rigid truck	8–10 t	3
Rigid truck	10–12 t	3
Rigid truck	12–16 t	3
Rigid truck	16–20 t	4
Rigid truck	>20 t	4
Semi-trailer	>20 t	4
Truck and dog	Urban tipper and dog	4

* Interpolated from fuel use estimates from VTA 2011, US DoE 2013, Centre for Transportation Research 2006, UK DfT 2010, USEPA 2002

3 OPTIONS FOR MANAGING IDLE TIME

There are two ways to reduce or stop engine idling: through operational and behavioural efficiencies (turning the engine off when not required), or by the use of control devices fitted to the vehicle.

OPERATIONAL EFFICIENCIES

Implementing operational efficiency improvements to reduce the occurrence of idling is the least-cost option, and requires behaviour change from the driver and/or organisation. These efficiencies could include:

- booking systems to ensure drivers are not required to wait to unload
- in instances where there is queuing, providing parking for trucks to wait rather than queue
- expanded hours or incentives for off-peak operation to avoid queues.

In all cases, drivers are a critical part of the success, and will require effective training or policies to make them aware of the need to reduce idling.

Strategies to change driver behaviour include:

- company or fleet policies
- training (which can be integrated with other safety/environmental driver training)
- financial incentives for good performers.

IDLE-OFF DEVICES

Idle-off technologies create the opportunity for increased fuel efficiency by switching off an internal combustion engine when the vehicle is stationary (i.e. idling). Idle-off devices can either shut down the engine after long periods of engine idling, or turn off the engine immediately when the vehicle stops (restarting when the brakes are released or throttle is pressed). The latter of these devices – often called stop/start technology – is becoming more common in light commercial vehicles which are increasingly using car-based technologies.

Idle reduction devices can either be part of the original vehicle or retrofitted. Fuel savings and emissions reductions arise from the cuts in total engine running time for a given route.

AUXILIARY POWER UNITS

Auxiliary power units (APUs) are mostly relevant to trucks with a significant auxiliary power load (i.e. equipment pumps and motors, and air-conditioning or heating) and are used to allow the main engine to be turned off while still running this equipment. They are more common in North America where drivers otherwise leave the engine idling overnight to power in-cab heating and appliances.

In Australia, there are several suppliers of commercially available APUs. The main purpose of these units is in providing stand-alone air-conditioning for sleeper cabs. Heavy vehicle driver fatigue guidelines have, in the past, nominated auxiliary air-conditioners as an element of basic and advanced fatigue management (COSH 2004, NTC 2007).

4 POTENTIAL ECONOMIC SAVINGS

Idle reduction technologies and strategies are a low-cost initiative that can reap immediate benefits. The proportion of fuel saving will be higher for smaller vehicles (i.e. light commercial vehicles and small rigid trucks). As a guide:

- In light commercial vehicles, idle reduction technology (including stop/start technology increasingly found in passenger cars) can produce 5–10% fuel savings, and a corresponding reduction in emissions (IEA 2012).
- Potential reductions in heavy vehicles are more difficult to quantify, as they relate to driver behaviour and vary significantly from fleet to fleet and from driver to driver. For example, a regional haul or interstate linehaul truck that spends a significant proportion of time idling may only save something like 2–4% of fuel use if idling is eliminated completely.
- Occupational and ambient air quality may also be improved with reduced idling, particularly when idling occurs in areas close to workers or the general public (depots, warehouses, loading queues and suburban footpaths).

5 EXAMPLES OF BENEFITS

The following are examples of fleets or manufacturers that have trialled or implemented idle reduction technologies and strategies.

- The Western Australian Department of Environment and Conservation undertook a trial with Toll IPEC and found that the company could save 200 L of diesel per vehicle, per year (in the trial fleet) by having light commercial drivers cut idling times by three hours per week. The full trial identified $50,000 in fuel savings and, if expanded to all light commercial vehicle fleets, a potential saving of $12 million (ATN 2008).
- The US Department of Energy facilitated a number of idle reduction technology demonstrations in 2007–2008, primarily for auxiliary power systems (US DoE 2008). The demonstrations showed that even at that time manufacturers had systems available that could reduce fuel consumption by 3–10% (depending on supplier and type of system).
- Ford published a fact sheet explaining how extended engine idling can reduce service intervals by two-thirds compared with a mileage-based approach only, particularly in engines that use engine oil for other functions, such as actuating the fuel injectors in their power stroke engine (Ford 2008).
- Some manufacturers are fitting idle-stop systems as original equipment in their light commercial vehicles and smaller trucks to reduce fuel used in engine idling (Ford 2014, VW 2014, Truckworld 2014).
- Previous case studies under the Green Truck Partnership have shown that driver training (including idle reduction) can achieve fuel savings of up to 15% (depending on driver, truck type and training frequency).

6 WHAT YOU CAN DO IN YOUR FLEET

As with all improvement strategies, the first step is to understand the existing operations of your fleet and identify where most idling is occurring. Implementing idle-off technologies in the wrong application (infrequent stop/starting), while not detrimental to the fleet, can drain effort and investment that would be more beneficial if spent in other areas.

INVESTIGATE AND EVALUATE OPTIONS

Fleet management companies offer data monitoring tools that can relay information from a vehicle engine to a computer either remotely or via a download (engine downloads, data loggers, GPS). Most of these provide information on time spent idling, which can be examined to identify any areas, drivers or trucks that spend a lot of time idling.

This task can be outsourced to an external provider or examined internally by screening for vehicles idling for more than a few minutes at a time.

Once you have identified where idling is occurring in your fleet you can evaluate the most suitable management strategy.

A fleet that is regularly stop/starting will benefit from the idle-off type technologies, whereas longhaul sleeper cabs will benefit from the auxiliary power units; all will benefit from driver training and operational efficiency improvements.

Additionally, if your GPS systems allow, identify particular locations where your fleet is idling and determine if there is an operational efficiency that could be implemented.

TRIAL ON A SMALL PORTION OF THE FLEET

Before implementing a fleet-wide strategy, experiment with a trial of equipment or programs on a sample of the fleet. The trial should:

- quantify the expected benefit
- identify any implementation barriers related to the company's processes, people or equipment.

Prior to the trial, ensure that baseline performance has been recorded and, to avoid skewing results, the only variable that should change during the trial is the idle management.

ROLL OUT ACROSS FLEET

Once the trial has been completed and the benefit quantified, establish a business case for rolling out the strategy across the fleet. Remember to focus first on the vehicles or people that will benefit most from any changes.

Be sure to continue monitoring fuel use so that you can review the effectiveness of the strategy against the baseline. Report the success of the measures back to management in dollar and productivity terms.

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