

Overview

Several factors have combined to create a surge of interest in idling reduction (IR). One is the increasing number of states and localities that have instituted restrictions on idling for trucks and other heavy vehicles. Extended idling by commercial trucks, both overnight and during the workday, also costs truck owners billions of dollars annually and uses a significant amount of our petroleum resources. Increased interest in

IR has led to rapid growth in the number of equipment suppliers and the types of IR devices available. Although many suppliers have joined together to educate potential customers and government agencies, individual manufacturers often provide conflicting claims about the comparative financial merits of different devices. That makes it difficult for truck owners to choose the right equipment for their needs.

Approach

This effort considers the types of devices available and provides a worksheet that allows a truck owner to estimate the costs, savings, and payback for each system. The truck owner must supply several inputs (particularly idling profile) to determine what the payback period is for each device and what the cash flow looks like as a function of time for typical inputs. Although it was developed with trucks in mind, the worksheet could be used for buses and other types of heavy vehicles as well.

Table 1. Cab Comfort Technologies

| System | Services | Fuel Use (gal/hour) | Installed Cost (\$) | Maintenance (\$/yr) | Charge (\$/hr) |
|--|---------------------|---------------------|---------------------|-----------------------|----------------|
| Idling (baseline) | All | 0.8 | 0 | See note ^a | 0 |
| Heat recovery | Heating | Negligible | 600 | 0 | 0 |
| Automatic start/stop | All, intermittently | 0.8 if on, 0 if off | 1200 | See note ^b | 0 |
| Cab/bunk heater | Heating (cab) | 0.04 | 1300 | 110 ^c | 0 |
| Evaporative cooler | Cooling | 0.015 | 1800 | 100 | 0 |
| Air conditioner | Cooling | 0.15 | 4000 ^d | 200 ^e | 0 |
| Auxiliary power unit (APU) or generator set | All | 0.2 | 8000 | 400 | 0 |
| Electrified parking space (EPS) (single system) ^f | All | 0 | 10 | 0 | 2 ^g |
| EPS (dual system) ^h | All | 0 | 2500 | 100 | 1 |

^a Defaults for idling maintenance: \$150/30,000 miles for oil change, \$10,000 at 500,000 miles for overhaul.
^b Same as idling, multiplied by the fraction of time the engine is on. Possible additional contribution from engine turning on repeatedly.
^c American Transportation Research Institute, *Idle Reduction Technology: Fleet Preferences Survey (February 2006)*.
^d No battery replacement included for battery-powered air conditioner.
^e A heating, cooling, and ventilation unit above each parking space is connected to a window-mounted service module via a flexible, reinforced, concentric hose that also delivers communications and entertainment packages.
^f On-board equipment powered by extension cord to wayside electrical pedestal.
^g \$2.18 per hour retail; \$1.85 per hour fleet discount. (Ref: Brass, Larika; iStare's promise: New financing could help put a Knoxville company in truck stops across America. *Knox News (February 20, 2006)* (accessed June 2, 2006).)
^h We conducted a brief informal survey of equipment manufacturers by e-mail to determine costs and fuel usage for several types of IR devices, using the results to create the default cost and energy use values shown in Table 1. We do not endorse any device; users need to obtain exact cost and performance quotes before making final decisions. These numbers are considered to be a good starting point for single-truck retrofit purchases. Installation on a fleet or as original equipment is likely to cost less per vehicle than a single-truck retrofit. Similarly, fuel use for the devices, or for idling tractors, will depend on the load put on them. If the truck is operated under extreme conditions, fuel use and fuel savings are likely to be higher than the typical values listed in this table. Note that the values listed in Table 1 were used to prepare Figures 2 and 3.

Figure 1. Truck Owner Economics Worksheet



The truck owner economics worksheet shown in Figure 1 is also available as an Excel spreadsheet. Repeated use of the worksheet allows comparison among devices, as was done here in Figures 2 and 3.



New regulations require truckers to rest 10 hours for every 11 hours behind the wheel. Comfort is the key to getting a good night's sleep, and it is the primary reason truckers idle their truck engines for long periods of time while parked. Photo of the interior of the Freightliner Coronado SleeperCab courtesy of Freightliner LLC.

Conclusions

1. Fuel-fired heaters are the least expensive means of providing heating for trucks that would otherwise idle overnight. The worksheet should be used to confirm whether an auxiliary air conditioning unit is also economical.
2. On-board IR systems (including dual-system EPS) are the least expensive means of providing full cab comfort services, in the event of high annual use hours and long retention of the systems (six years illustrated here).

Figure 2. Payback Time vs. Fuel Price, by Device, Used 2,000 Hours per Year

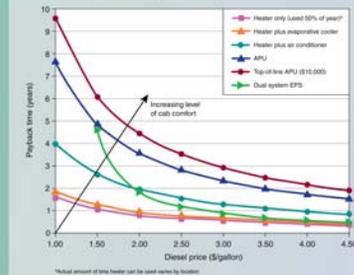


Figure 2 shows how payback time varies with fuel price for a range of device costs (from \$1,300 to \$10,000) for a long-haul truck that idles for 2,000 hours per year (40 h/week x 50 weeks). At \$3 per gallon for diesel fuel, devices costing \$7,000 or less pay back their investment in the two-years-or-less timeframe that many truck owners have cited as a goal, and even devices costing \$10,000 pay back in under three years. The same analysis can be performed for day cabs, but because these trucks idle fewer hours per day, only a much smaller investment will pay back in an acceptable period. Payback for the single-system electrified parking space (EPS) is immediate at fuel prices over \$2.50 per gallon, but Figure 3 shows that other criteria are also important.

Figure 3. Total Cost for Six Years of Operation vs. Idling Time @ \$3/gallon

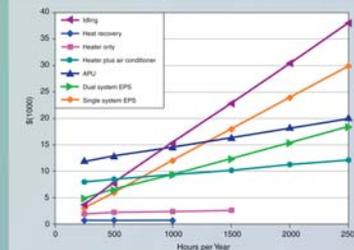


Figure 3 compares total cost to the truck owner over six years for different IR systems, assuming the current diesel price of \$3 per gallon. This graph shows that, for the technology options that supply both heating and cooling, the relative ranking changes as a function of hours of idling eliminated. It is also true that diesel fuel price and length of ownership can change these rankings. Expensive fuel and long vehicle ownership favor on-board options and the dual-system EPS. Also note that the heater and heat recovery options are only needed in winter, and heat recovery only has capacity for up to four hours per day.

3. For a low-annual-use case, a single-system EPS (an off-board system) is the least expensive full-service choice when fuel prices are high.

Note: Unknowns such as quality of service, IR device reliability, and variations in truck owner and driver preferences and in the need for services mean that the findings are informative, but not conclusive. Each option must be evaluated on its merits, as applicable to the owner's needs, before a purchase decision can be reached.