RESULT 433

CADDET energy efficiency IEA OECD

CA 01.508/4X.E01

Energy management technology

Intelligent controller heats vehicle engines for less

Summary

To facilitate starting in the cold winter months, block heaters are used to warm engines on some 4.8 million Canadian vehicles. Block heaters are often used at home and at work, with significant energy wastage occurring when engines are heated while still warm from use. The Intelligent Parking Lot Controller (IPLC) has been developed to overcome this wastage. The small programmable device plugs directly into an outdoor electrical outlet, and controls how much power is delivered to the block heater as a function of temperature and time. The IPLC won the Energy Management Technology category at Canada's Energy Efficiency Awards 2000.

Highlights

- **Energy savings and smoother heating loads**
- **Block heater energy consumption cut by 65% on average**
- **Operates between –60°C and 55°C**
- **Potential payback period of 1.5 years**

The IPLC M200 dual parking stall controller.

Aim of the Project

In climates with many very cold days, vehicles are often equipped with engine block heaters, which keep the engine warm and facilitate starting after a vehicle has been parked for several hours. The amount of energy needed to keep the engine at a satisfactory temperature depends on the external temperature, with less energy being needed on warmer days than on colder days. Conventional block heaters, however, apply a constant rate of heating irrespective of the outside temperature.

The Intelligent Parking Lot Controller (IPLC) has been developed by a Canadian company to eliminate energy wastage during engine heating. The microprocessor-controlled plug connects to a vehicle's winter engine equipment and controls the flow of power to the heater according to several factors, including temperature, wind chill and time, thereby saving both energy and costs.

The Principle

Conventional block heaters apply a constant heating load to a vehicle's heating equipment, irrespective of the engine temperature or external conditions. The IPLC controls the amount of energy sent to the heater taking into account a number of factors, including the engine temperature, outdoor temperature and wind chill, the amount of current drawn, the time of day the heater is in use, and the length of time the heater has been plugged in. Current is only sent to the block heater once the engine has cooled to a certain temperature, thus eliminating a major source of energy waste. One IPLC unit can control the heating for two vehicles.

The controller runs under customised software that is compatible with Windows 95/98/NT (trademarks of Microsoft Corporation). The unit records data on its own use and performance, including calculated energy savings, total time in use, average time in use, size of load (in watts), number of overloads and number of short-term power failures. The IPLC also checks block heater function and can alert the user if a malfunction is detected. An optional interface unit enables data to be downloaded to a computer for further analysis, or to change the control schemes at different parking locations.

The Situation

The IPLC is a small, box-like device (see the dimensions in Figure 1) constructed from virgin Alloy 356.1, with a wall thickness of over 32 mm. The unit can be plugged directly into a standard Canadian outdoor electrical outlet, with versions available for service in countries with 220 VAC, 50 Hz supplies. As a self-heating device, it is capable of operating within a wide temperature range of -60°C to 55°C. The projected lifecycle of each unit, calculated from failure statistics for components, is estimated at 15 years.

When a vehicle is first plugged into the controller, ***full power*** is applied for 2-3 minutes to check the function of the vehicle's heating equipment. This system check is followed by a period of ***no charge*** if the vehicle's engine is still warm from use. After two hours, the controller begins a four-hour cycling mode, where ***full power*** is applied for part of each 4.5-minute cycle depending on the ambient temperature:

- ***above –5°C*** - no power is applied;
- ***between –5°C and –25°C*** - power is applied for 20-100% of the cycle;
- ***below –25°C*** - power is applied constantly.

Finally, the IPLC enters ***full-power*** mode for three hours, to prepare the vehicle for use.

Significant energy savings can be realised by using an IPLC unit. The two-hour power delay at the beginning of the cycle alone is responsible for a 25% energy saving over other cycling controls. On average, each unit saves over

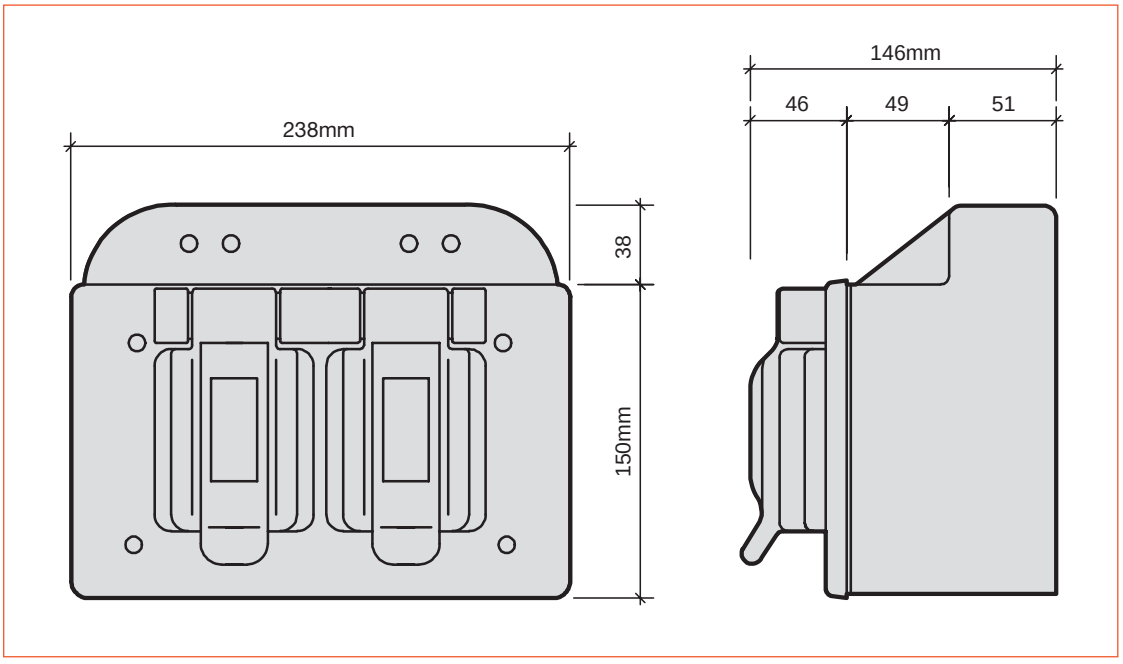

Figure 1: Dimensions of the IPLC device.

1,400 kWh/year, a saving of around 65% compared with using a conventional, uncontrolled block heater. During its projected 15-year service life, the savings per unit could amount to over 21,000 kWh. If the devices are widely used, there could be substantial energy savings.

On the environmental side, each IPLC unit reduces carbon dioxide (CO_2) emissions on average by some 0.30 tonnes/year, or by over 4.6 tonnes during its projected service life.

The Company

Intelligent Parking Lot Controller Corp. is a spin-off of Vantera Incorporated, the engineering company behind the IPLC. IPLC Corp. aims to provide 'intelligent' energy conservation controls that adapt to utility, management and user needs while offering a user-friendly interface. The IPLC unit is seen as a winning combination of energy management, ergonomics and technology.

Economics

Although the savings and payback periods realised by using IPLC devices depend on local electricity prices and the ambient temperature during use, there are clear economic and environmental advantages to their use.

An IPLC unit currently costs around CAD 150 (where CAD is the Canadian dollar), however the unit price is expected to fall to nearer CAD 100 when it is in mass production. Based on average electricity prices for Canada, and one IPLC unit controlling two vehicles' heating equipment, each device saves around CAD 66/year, resulting in a simple payback period of 2.2 years. With mass-production priced units, the payback period would be reduced to just 1.5 years.

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International Energy Agency
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CADDET
CADDET was set up in 1988 as an IEA Centre for the Analysis and Dissemination of Demonstrated Energy Technologies. Today, there are two CADDET programmes; one is for energy-efficient technologies and the other for renewable energy technologies. The CADDET Centre co-operates with member countries in the exchange of high-quality information on energy technologies.

See the whole range of CADDET Energy Efficiency projects on www.caddet-ee.org

March 2002