



## Information Sheet # 38

*Your Reliable Guide for Power Solutions*

# Block Heaters

### 1.0 Introduction

One of the best methods to ensure an engine on a generator set systems starts easily and quickly is to keep the engine warm. One of the most frequently used accessories used for maintaining a warm engine is the engine block heater.

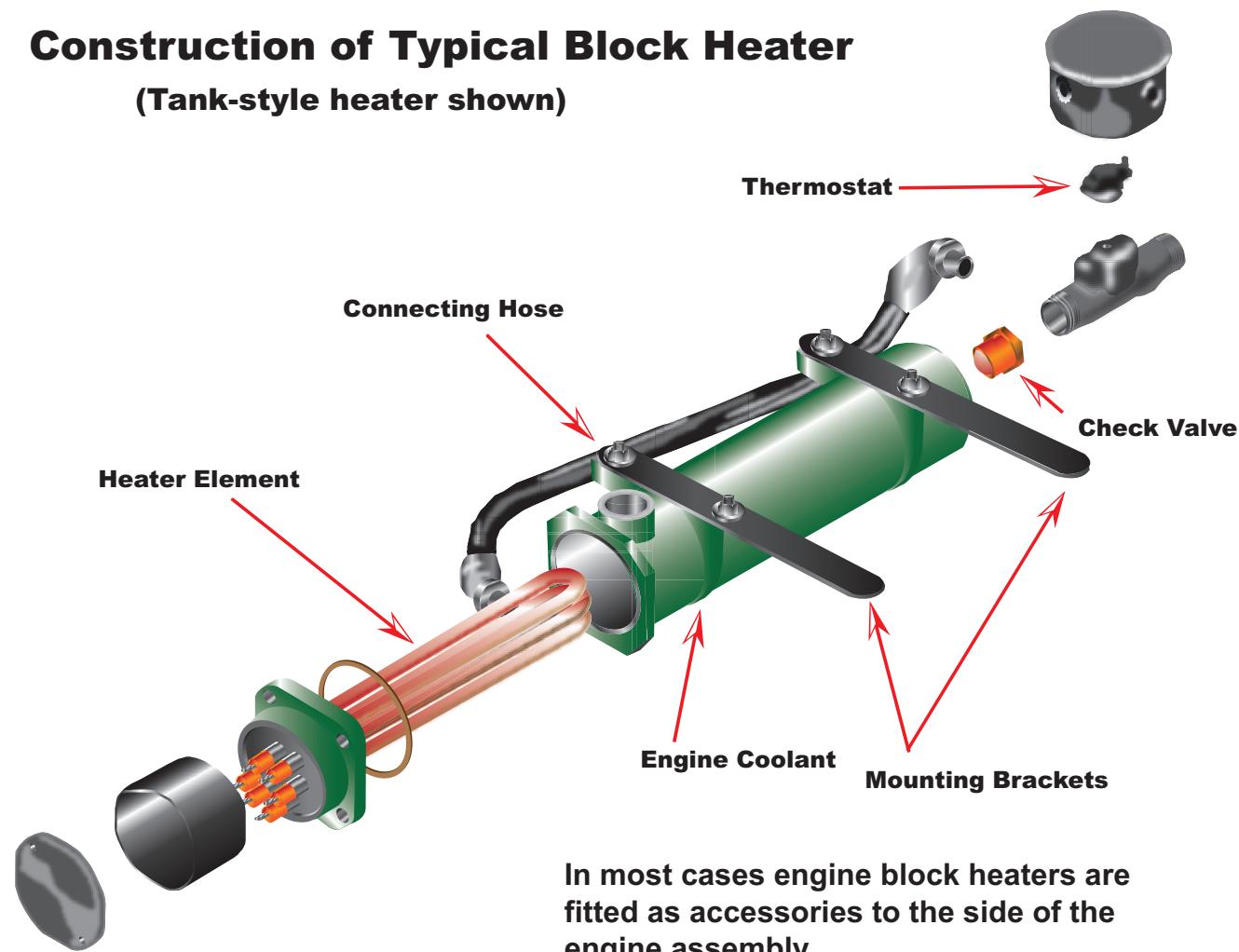
*This information sheet discusses engine block heaters detailing their merits, different types and location on the engine. The sheet also details why the National Fire Protection Agency (NFPA) recommends standby generator set systems should be heated.*

### 2.0 When engine block heaters are used

Engine block heaters are normally supplied and installed as an accessory and form part of the original, standard equipment from all standby generator set manufacturers. They are used where the generator is subject to ambient temperature below 60°F (16°C) in order to preheat the water jacket coolant of the diesel/natural gas 'driver' engine and maintain it, thus assisting the engine start cycle for rapid, easy 'on-line' performance. *(Continued over)*

## Construction of Typical Block Heater

**(Tank-style heater shown)**



**In most cases engine block heaters are fitted as accessories to the side of the engine assembly**

To fulfill our commitment to be the leading supplier and preferred service provider in the Power Generation Industry, the Clifford Power Systems, Inc. team maintains up-to-date technology and information standards on Power Industry changes, regulations and trends. As a service, our **Information Sheets** are circulated on a regular basis, to existing and potential Power Customers to maintain awareness of changes and developments in engineering standards, electrical codes, and technology impacting the Power Generation Industry.



(Continued from previous page)

### 3.0 NFPA requirements concerning heated engines

Engine driven standby generator sets are primarily left unattended. It is very important that the customer/operator is fully aware of the importance of this start aid. In cases where any electrical power outage could seriously disrupt critical processes or put the safety of people at risk, the National Fire Protection Agency (NFPA) requires under code 110, that Emergency Power Supply (EPS) - such as standby generators, shall be heated as necessary in order to maintain the engine's water jacket temperature, so that the EPS will start and carry the full emergency loads within 10 seconds after loss of primary power from the utility.

### 4.0 Different types of block heaters

There are a number of different types of block heaters to operate while the engine-driven generator is shutdown in colder climates, which we describe below:

**Radiator-hose heater** - This heater is fitted into the bottom radiator hose and the coolant circulates by thermal convection.

The heater range is limited by available hose sizes and due to relatively low watts (typically 400 to 600 watts). This normally makes radiator hose heaters unsuitable for preheating large engines and we would rarely recommend this type for most standby generators above 15kW.

**Freeze plug heater** - These pre-heaters are fitted in the engine block using a freeze plug hole in the cylinder/crankcase and protrude into the coolant chamber. They serve to circulate heated coolant throughout the block by thermal siphon action. The downside of this type is risk of coolant leaks.

**Tank-style heaters** - These are installed on or close to the engine and connected to the coolant circuit, and powered by single or three phase AC source via a power cord, while the engine is stationary. They are available in sizes from 500 to 5000 watts, dependent on the engine displacement and the ambient temperature encountered at site. They circulate the coolant throughout the engine and can be adjusted by a thermostat, if needed, to ensure the coolant is kept at the correct temperature or even have an automatic clock-controlled timer. The heater is automatically shut off once start cycle is initiated by means of an oil pressure sensor switch. On larger engines, the tank-style heater can be supplied with a circulating pump, rather than relying on convection. (See diagram page-one)

### 6.0 Benefits of using engine block heaters

The key reason for using an engine block heater is to maintain the engine at a temperature above 60° F (16° C) to ensure it starts quickly when required. Cold engines can take a considerable time to crank up during which time the starter batteries will be heavily discharged. However apart from a starting aid, the heaters provide the following additional benefits:

**Reduces engine wear** - Engine wear can be reduced by up to 50%. The lubricating oil is also kept warm and thus ensures that the essential oil is immediately pumped to the critical moving parts and points of the engine during the start cycle.

**Saves fuel** - It is not necessary to leave engines idling to maintain them above the required starting temperature.

**Reduced exhaust emissions on start** - Engines are designed to emit lower emissions at their operational temperature.

**Less stress on other components** - Batteries when cold have a reduced ampere hour capacity and starting a cold engine can put a considerable drain on a battery system.

**Avoids the risk of water condensation in the engine sump** - An engine system left for a length of time in cold temperatures will see an increase in water build up due to condensation. Keeping the engine warmer than the surrounding ambient significantly reduces condensation.

### 7.0 Maintenance points for engine block heaters

As with all key components, regular maintenance will ensure the equipment remains in full operation and ready to perform its function when required. The following are key maintenance points for engine block heaters:

**Clips** - Always be check these items when carrying out routine maintenance (preferably weekly in extreme conditions) on the generator to ensure that it is functioning correctly and the element is not damaged.

**Hoses** - Any hoses found not to be pliable should be changed every three years.

**Coolant mix** - It is important that the correct mix of coolant is used to avoid damage to the block heater.

