ULTIMATE SERVICE ASSOCIATES
A NORTH AMERICAN SITE SERVICES CO.

*The ultimate solution for maintaining your nationwide generator network*

# Thermal Blankets Used Within a Generator System

## 1.0 Introduction:

Diesel and gaseous reciprocating engines are the most common power source to drive the generator in standby or prime power generator systems. As for any 4-stroke engine, less than 40% of the fuel energy burnt is converted to electrical power, apart from mechanical efficiencies, the rest of the fuel energy is converted to heat. Those responsible for designing and installing generator systems have to consider how to manage the heat generated as a result of engine combustion.

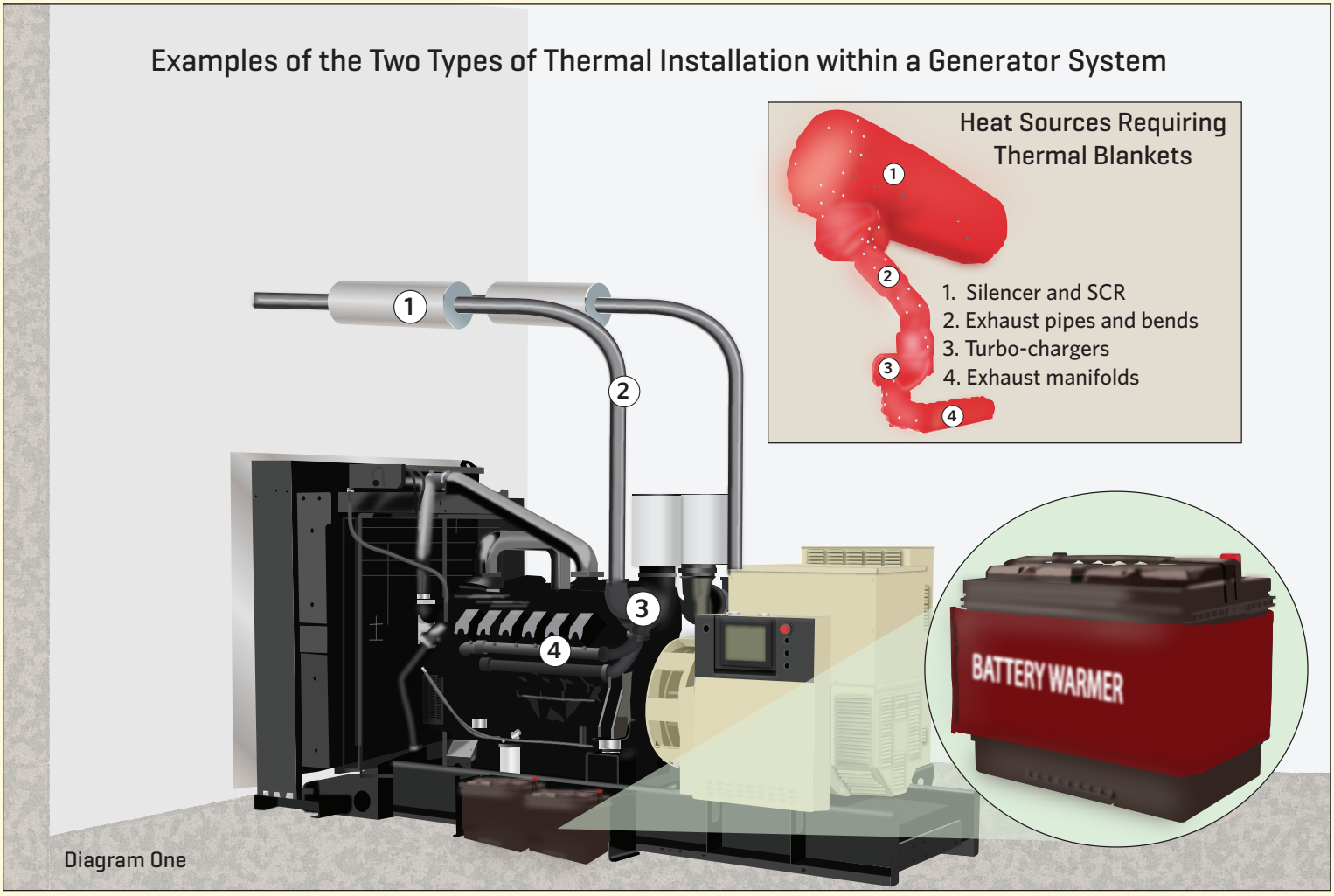
***This Information Sheet discusses the types of thermal insulation used in generator systems, their purpose, and when there is a particular requirement for thermal blanket insulation.***

## 2.0 Reasons for Using a Thermal Blanket:

There are two primary reasons for utilizing a thermal blanket.

1. To insulate the surrounding area from the heat being generated from engine combustion.
2. To insulate components within a generator system from extremely cold ambient air.

Thermal blankets have insulation material to prevent radiated heat to the surrounding air and to lower heat loss due to cold ambient. *(Continued Over.)*




To fulfill our commitment to be the leading network service provider in the Power Generation Industry, the USA, 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.

### 3.0 Insulating the surrounding area from the heat being generated from engine combustion:

The heat generated from an internal combustion engine is managed by its cooling system. Water-cooled engines, the most commonly used prime movers in a generator system, discharge the coolant heat generated through a radiator sized to manage coolant flow. However, in addition to the heat expelled by the radiator there are several other sources of heat radiating to the engine surroundings, exhaust temperatures that can reach 1200°F (650°C), engine components such as the crankcase, cylinder heads, turbo chargers, oil-coolers, and water pumps, and electrical components. (See Diagram One)

A system designer will ensure there is sufficient ventilation to manage radiated heat within a generator room or enclosure. However, when installations are very confined with insufficient ventilation, excessive heat buildup can result in a hazardous operating environment for personnel and the components within the generator system. The most common solution is to wrap the heat producing components with thermal insulation, termed thermal blankets (or alternatively, wraps).

**3.1 Types of Thermal Blankets:** There are principally two types of thermal blankets (All materials to specific fire codes).

- Moderate heat rejection is managed by blanket-style wraps with a thickness of 1 to 3 inches of thermal insulation material sandwiched between two layers of flexible fabric.
- To control heat rejection, thermal protection is achieved with silica, quartz, or ceramic cloths. For components with higher heat rejection, e.g. turbo-chargers, wraps are pre-formed to fit specific components, with some variations having a metal skin.
- Components including engine exhaust manifolds, silencers and turbochargers can be wrapped with removable insulating material as required to reduce radiated heat within a restricted space, such as in marine engine rooms.
- In a confined space when exhaust silencers cannot be mounted externally they should be insulated with custom built forms for the specific exhaust silencer.

### 4.0 Insulation of Tier 4 Engines Equipped with Selective Catalytic Reduction (SCR) and Catalysts:

After-treatment exhaust systems applied to lower emission engines rely on high exhaust temperatures, often in excess of 800°F (425°C) to attain complete combustion of controlled emissions components. Thermal insulation is applied to exhaust manifolds and pipes to ensure the exhaust temperature is maintained as it travels to the after-treatment components.

### 5.0 Application and Removability of Thermal Blanket Material:

In many cases the generator set as supplied by the manufacturer will be supplied with a degree of thermal insulation on various components including exhaust pipes and turbo-chargers. When additional thermal insulation material has to be retroactively fitted to the generator system to meet specific installation ambient heat requirements, the following should be considered:

**5.1 Complies with Manufactures Recommendations:** The generator's cooling system has been designed to manage its tested degree of heat rejection. In shielding personnel from high temperature components and reducing surrounding ambient temperatures the manufacturer, or their authorized distributor should be consulted to see if there are pre-approved insulation techniques or recommendations. Incorrect application could jeopardize the manufacturer's warranty.

**5.2 Removability and Serviceability:** Any generator fitted with insulation material as supplied by the manufacturer will be designed to be easily disassembled for service should it be required. Retrofitted thermal insulation should be applied in a manner that it can be easily removed and replaced during service. Approved manufacturers of removable insulation blankets have designed blankets to be easily installed and removed to allow access to parts for maintenance and inspection.

**5.3 Recommended Material:** When choosing material to insulate generator components ensure that they meet applicable fire and OSHA standards. Most blankets for exhaust applications are made of an insulating spun material of calcium, silica, or other special fibers with a heat resistant thermal cloth outer layer.

### 6.0 Insulating Generator System Components from Extreme Temperatures:

In addition to insulating the surrounding environment from heat produced from generator systems components, there is also a need to protect certain components from ambient temperatures to ensure correct functionality. The cooling system will be sized to manage affective operation in high temperature environments. However, excessive cold can be an issue for standby generator systems that for the majority of their time are stationary in standby mode.

One of the main uses of thermal blankets is to cover starter batteries. A starter battery is sized to give an ampere hour capacity and cranking amps specification at an optimal battery temperature of 80°F (27°C). A lead acid battery can only provide 65% of its full cranking power in freezing temperatures; in extreme winter temperatures, cranking power can be as low as 40% of its nominal rating.

It is recommended for generator installations that are outdoors or in an unheated environment that thermal battery blankets are used. The thermal blanket is fitted with a heater coil to maintain the optimal 80°F operating temperature. The thermostatically controlled heater is powered from the AC supply, with the thermal insulation retaining the heat to avoid constant operation of the heater element.

Lead acid battery blankets are designed with varying measurements to suit different battery sizes and to recognized UL standards. Alternatively, batteries are placed in an insulated battery box fitted with a thermostatically controlled heating pad to avoid overheating the battery. Note! Nickel-cadmium batteries should not be subjected to battery heaters.

### 7.0 Additional Sources of Information on Thermal Insulation:

Your authorized generator distributor can provide further information regarding thermal insulation of your generator system. In addition, the review National Insulation Association website: https://insulation.org

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