



## Thermo-Tec



### PWA University Lesson One

#### Company Background

Thermo-Tec has been a major company in the exhaust performance market since 1987, when it introduced the now famous Thermo-Tec header wrap product. Headquartered in Greenwich in north central Ohio, Thermo-Tec has dramatically expanded its line of heat control products over the years. Today, the company manufactures and markets over 130 products for street cars and trucks, motorcycles/ATVs, motorsports, RVs, marine, aerospace, agriculture, mining, industrial and other applications.

The company's product line can be categorized into three areas: performance, reflective heat control and heat/sound control. The products can stand alone, or used in conjunction with others to achieve increase performance and/or comfort.

Each of these areas will have a lesson devoted to the category, how it functions and the features and benefits to the customer. **Lesson One** will focus on the Thermo-Tec performance header wrap and related products. **Lesson Two** will address the reflective heat control products. **Lesson Three** will address sound deadening/heat barrier products. Each lesson will include examination of supporting products for each category.

#### Thermo-Tec Performance Header Wrap

The Thermo-Tec header wrap is the company's original product and is still the cornerstone of the product line.



The header wrap is a proprietary woven product using Thermo-Tec's Thermal Conduction Technology (T-C-T™) of a treated inorganic material, which has the unique property of being capable of transferring heat evenly across the surface. The material is designed to withstand temperatures up to 2000° F (1093° C) without damage. It is important to know that there is **NO ASBESTOS** material used in Thermo-Tec header wrap material.

#### How Does It Work?

The Thermo-Tec wrap effectively improves the scavenging of exhaust gases by the headers from the engine's combustion chambers.

It uses a basic law of physics to make it happen. Think of exhaust gas as a fluid – such as gear lube. Gear lube when cold flows very slowly, but when heated, it flows much easier. In the exhaust header tube, the exhaust gas enters at a high temperature at 1350-1400° F (732-760° C), then expands down the tube. But, as it travels down the tube to the exhaust outlet, it cools and slows. The slowing lessens the desired scavenging effect.

Wrapping the header with Thermo-Tec material holds the heat within the tube; while at the same time reducing the escaping heat and helping lower the underhood temperatures. Both improve power.

The retention of heat in the header tube allows the gas to continue to expand, build velocity, which in turn lowers the pressure behind the exhaust pulse. This is, in effect, creates a partial vacuum that provides a greater scavenging effect, pulling more exhaust gases out of the combustion chamber on the exhaust stroke. This lowers the pressure within the combustion chamber and reduces the energy loss created by the piston, rod and crank pushing the spent gases out of the cylinder (commonly referred to as “pumping loss”).

The scavenging effect also improves the introduction of the intake charge of fresh fuel/air mixture to the combustion chamber during the “overlap phase” where the intake and exhaust valves are both open near the top of the exhaust stroke. The vacuum created by departing exhaust gas allows the incoming fuel/air charge to enter the combustion chamber more quickly, adding more volume and creating more power.

The lowering of the temperature under the hood also increases power potentials. How much can lower underhood temperatures help performance? Research has shown for *each degree drop of underhood temperature, horsepower increases by over 1 percent*. This is due to a more dense air charge and increased fuel density when it is introduced to the air. Together there is more oxygen and fuel in the intake charge and that equals more power. Additionally, the exhaust wrap can improve fuel economy since the engine is operating more efficiently.

Just how much will the Thermo-Tec material help reduce underhood temperature? Knowing the temperature of the exhaust gas in at 1350-1400° F (732-760° C) when it enters the header, Thermo-Tec’s research has shown the temperature on the outside of the material is at 755° F (402° C), a 42.5% reduction in potential radiated heat under the hood.

Thermo-Tec has recently introduced the Generation II Copper header wrap. The Generation II product offers 30% greater heat insulation capability than the original product, bringing the temperature outside the wrap down to 529° F (281° C).

So, you can clearly see how the Thermo-Tec header wrap material works to improve the engine’s overall efficiency, controls undesirable under the hood heat, plus improves driver comfort.

### **Types of Thermo-Tec Header Wrap**

There are three versions of the Thermo-Tec header wrap. The original product is a neutral tan-beige color. Black Thermo-Tec wrap is graphite impregnated for cosmetic purposes...there is no difference in performance. The Generation II Copper header wrap is copper colored. The wrap comes in 1 in (2.54 cm), 2 in (5.08 cm) and 6 in (15.24 cm) widths, in lengths of 15 ft (4.57 meters), 50 ft (15.24 meters) and 100 ft (30.48 meters).

A *rule of thumb* for the amount needed to install on engines is to use one 2 in x 50 ft roll for a 4-cylinder engine, two 2 in x 50 ft rolls for a V-6 or V-8 engine, and three 2 in x 50 ft rolls for a big block V-8 or a set of 180 degree headers. The customer will cut the rolls into the number of

needed lengths. Be certain the customer understands *every bend in the header needs an additional 8 in (20.3 cm) of length.*

### **Handling customer questions**

To address customer questions, here are some FAQs and their answers.

**Q.** How is Thermo-Tec header wrap installed?

**A.** The header wrap is wound onto the header starting at the header flange with a 1/4 in (6.35 mm) overlap. Care must be taken to keep the overlap consistent, too much may create hot spots (leading to metal fatigue), too little and the effectiveness may be diminished. Ideally, you should install the wrap on the header before mounting it on the engine.

**Q.** How do I secure the Thermo-Tec header wrap to the header?

**A.** The wrap is secured to each header tube using Thermo-Tec Snap Strap™ stainless steel securing bands (available separately, see below) at the header flange and at the end point at the collector.

**Q.** Can Thermo-Tec header wrap be used on cast iron exhaust manifolds?

**A.** ***NO!*** Cast iron manifolds are generally considered to have potential failure risks due to variations in wall thickness, particularly for cast iron manifolds in turbocharged applications where the casting may be modified. The heating/cooling cycles may cause the casting to become brittle, eventually leading to failure with cracking. ***Note:*** *Headers used in turboed applications can be wrapped. See the section on Turbo Insulation Kits.*

**Q.** Engines in RVs and towing applications are known for generating higher than normal exhaust temperatures. Can the exhaust wrap be used on these vehicles?

**A.** If the vehicle in question is equipped with headers, the answer is “Yes.” However, Thermo-Tec recommends wrapping only 18-20 in (45.75-50.8 cm) of the primary tubes. The collectors allow the excess heat to bleed off.

**Q:** Can Thermo-Tec product be used on diesel applications?

**A:** Yes. On turbocharged diesel applications, Thermo-Tec Header Wrap product and the Turbocharger Insulation Kit (see below) produce excellent power gains. The header wrap can be used on the down pipe between the stock manifold and the turbo exhaust housing inlet. The turbo cover kit only will do a good job of maintaining exhaust heat and flow, but testing shows using the turbo cover kit and wrapping the downpipe does a better job by at least 30%. Insulation of the downpipe out of the turbo will insulate, but will not improve exhaust flow or improve power.

**Q.** Will Thermo-Tec header wrap damage the headers?

**A.** No...if the header wrap is properly installed, and the header is sourced from a reputable manufacturer, there is no problem. The header surface should be as clean as possible and with no

holes or other major damage, and the wrap won't affect a header manufacturer's warranty if installed according to directions.

**Q.** What about wrapping catalytic converters and mufflers?

**A.** Thermo-Tec header wrap can be used on both, again following the overlap directions.

**Q.** Is Thermo-Tec header wrap okay to use on coated headers?

**A.** Yes. The material used in ceramic coatings is to protect the header against corrosion; correctly installed wrap will not damage the coating.

**Q.** Is it normal for smoke to come from the wrap on the first start up after installing it?

**A.** Yes. After installation, the initial start up will produce smoke. This is part of the normal curing process of the material. The vehicle should be started and run outside for approximately 30 to 45 minutes to fully cure the material. While the smoke is not toxic, it is not advisable to breathe the vapors.

### **Related Products**

#### **High Velocity Exhaust Jackets**

A similar product are **High Velocity Exhaust Jackets**, sheets of 8 in (20.3 cm) wide Thermo-Tec wrap in 12 ft (3.66 meters) (4-6 cylinder engines) or 16 ft (4.88 meter) (8 cylinder engines) lengths. The major benefit is the jacket can be installed upon an in-place header. The jackets are installed vertically on the upper end of the header tube and secured using the stainless steel Crimp-Loc fasteners included. Use of the Snap Strap™ stainless steel securing bands at the header flange is highly recommended. Because of the nature of the installation, the Exhaust Jackets are not as efficient as the exhaust wrap in improving power and lowering underhood temperatures, but do provide a significant improvement over bare headers. The Exhaust Jackets are ideal for use in RVs and towing vehicles.



#### **Header Manifold Blanket**



The **Header Manifold Blanket** is designed to retain heat coming from headers or cast exhaust manifolds. The flexible blanket clips into place on the upper portion of the header or manifold, with the fabric side in. The aluminumized side faces out and offers protection from abrasion or spilled liquids. The Header Manifold Blanket does not offer the performance gains from the Header Wrap products or Exhaust Jackets, but does control underhood heat, making it very useful for RV and tow vehicle use. The blankets come in kit form: V6 and V8 engines use two 20 in (50.8 cm) X 24 in (61 cm) blankets, for inline 4 and 6 cylinder engines, one 24 in (61 cm) X 40 in (1.02 meters) is used.

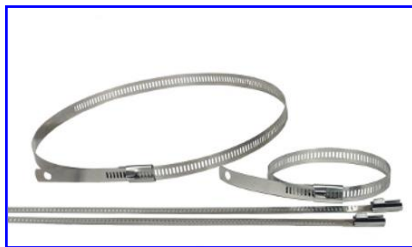
## Turbocharger Insulating Kit

Thermo-Tec offers a **Turbocharger Insulating Kit**. The key to turbo performance is to keep a flow of high temperature exhaust gases moving through the exhaust side impeller. By keeping the temperatures high, the incidence of turbo lag is virtually eliminated. The turbo kit consists of the tan TCT™ insulation which is installed over the exhaust housing, and secured with the stainless steel wire that is included. The aluminized reflective fabric material is cut to fit and placed over the insulation. Using Thermo-Tec header wrap on the pipe between the exhaust manifold and the inlet to the impeller assures the greatest performance. Two kits are available: one for 4-cylinder engines, the second for 6- and 8-cylinder engines. These kits are ideal for use with turbocharged diesel engines – light or heavy duty.



## Related products for add-on sales

### Snap Strap™



The stainless steel clamps are available in 9 in (22.9 cm) and 18 in (45.7 cm) lengths. The clamps are easy to use – insert the end through the multi-lock clamp and pull to tighten. Snap Strap™ kits are available for V6 and V8 applications with 9” and 18” clamps. Packages of 12- 9 inch or 6- 18 inch clamps are also available. The Snap Straps should be considered a **MUST HAVE** with each purchase of header wrap material.

### Spray-on coatings



Thermo-Tec offers three Hi-Heat coatings to further enhance the wrap for appearance and durability. Available in aluminum (silver), black and copper, the coatings toughen the wrap material, protecting against abrasion and harmful liquid spills. The coatings are effective up to 2000° F (1093.3° C), and also are ideal as a metal paint.

## **Key points for Thermo-Tec Header Wrap**

1. Increases power by improved engine scavenging
2. Lowers underhood temperatures by up to 70 percent which improves power and driver comfort
3. Header wrap must overlap by ¼ in (6.35 mm) for best results
4. Uses non-asbestos T-C-T™ inorganic material which conducts heat uniformly and will withstand continuous heat up to 2000° F (1093° C)
5. Will not damage headers from reputable manufacturers when correctly installed
6. Can be used on mufflers and catalytic converters
7. Towing and RV applications should wrap only up to 18-20 in (45.75-50.8 cm) of the primary tubes
8. Cast iron manifolds **should not** use Thermo-Tec header wrap