

Comparison of tyrewarmer technologies

Up to now 5 Formula 1 teams, all German DTM Teams and a lot of teams in the motorcycle world championship trust on the KLS technology after extensive tests.

From others we will often asked, what the significant difference is between KLS tyrewarmers and conventional tyrewarmers.

The answer: KLS uses a (patented) "heating mat" that provides a very equal heat distribution without any "hot spots" or "hot lines", which badly influence the tyre compound whilst the heating process.

To show the effect a thermo-sensitive foil, was put between the tyre and the tyrewarmer. This foil is originally pure white and turns gradually darker depending on a rising temperature (black from $>120^{\circ}\text{C}$). You can see the result clearly on the following thermographic pictures.



Pic 1: Racing car tyre (85°C), heated with KLS technology



Pic 2: Racing car tyre, heated with conventional hot wire technology

Pic 1: The light grey colour of the thermo-sensitive foil indicates a very equal temperature distribution on the whole grid of about 85°C (after 45 minutes of heating). The KLS technology enables to heat up the tyres rapidly, but without overheated areas caused by local hot spots or areas. This will maintain the maximum grip of the tyre compound and makes it possible to create the set temperature very accurately.

In combination with the KLS rim heaters for cars it enables the racing teams to achieve a constant and equal tyre pressure from the first lap of the race.

Pic 2: For all conventional blankets on the market a heating technology is used with a heating wire inside, running along, across or in waves. They all struggle with the same problem, because they can not heat up the tyres without having critical hot spots/lines of overheated areas. This effect can be seen on the thermographic pictures, showing the dark lines. These dark lines indicate overheated tyre areas ($\sim 120^{\circ}\text{C}$ and more!) directly underneath the heating wires of the blanket.

Moreover there are big gaps ($\sim 25\text{ mm}$) between these heating wires. As a tyre rubber is rather bad in thermal conduction, the short wires have to get very hot, to heat up the whole tyre in an acceptable period of time.

The excessive heat of the hot wires is bad for the sensitive tyre compound. Soft making components are literally “cooked out” of the tyre and a loss of grip and a reduced tyre lifetime is the result.



Pic 3: Thermographic result on a motorcycle tyre with conventional tyrewarmer . . .



Pic 4: . . . with an undesired, visible effect on the sensitive tyre compound

As an example in **Pic 3 and 4** a motorcycle tyre shows, how the unequal temperature distribution badly influences the tyre surface. Softmaking tyre compounds were cooked out to the tyre surface. In this case it is clearly visible with those dark areas in **Pic 4**. This may not always be visible as clear as in this picture (it depends on heating times, temperatures, tyre compound etc), but the bad influence to the tyre compound is always existing.



Pic 5: Heating wires across



Pic 6: Heating wires in waves



Pic 7: Equal heating with KLS technology

Pics 5 and 6 are just two more examples to show, that - after 45 minutes of heating - other brands of tyrewarmers create the same problem by using the same hot wire technology basically.

Pic 7 again shows the equal temperature distribution with the unique KLS technology. The light grey colour indicates an very equal temperature distribution of ~ 85°C on the tyre surface.

The reason why KLS products are more expensive than the others is quite simple: Each single KLS tyrewarmer/rimheater is completely handmade in our workshop in Munich/Germany from qualified engineering personell and by using the best and most expensive materials on the market to realize this unique KLS heating technology for a maximum tyre grip and lifetime.