"SUSTAINABILITY THROUGH INNOVATION"

Infrared asphalt heating myths, facts and fallacies

In the asphalt-repair world we hear frequent remarks about how infrared repairs simply do not work, or damage the asphalt or how they simply do not address fundamental asphalt –pavement problems. These multiple opinions are usually based on incorrect information, or bad experiences or even on the accepted approach to infrared when it surfaced some 35 years ago.

The earliest infrared heaters employed a large array of thick ceramic tiles which were heated to very high temperatures and massive heat-densities with the intent of softening the asphalt concrete by over-heating and even burning it in an effort to remove it as quickly as possible, then dispose of the spoilt asphalt. Heating time of these large, heavy tiles was upwards of twenty minutes, and once lowered to the asphalt, there was simply no way to control temperature or heat-density and thermal damage to the asphalt surface was almost inevitable. In addition the tile-temperatures generated, as well as the material of the emitter surface were not even close to the natural absorption spectrum of the average asphalt surface so that the true essence of optimising infrared –heating, namely the close matching of emission and absorption spectra, was simply not there! It was analogous to using a 4 pound hammer to repair a modern cell-phone!

Oil prices, transportation costs, environmental issues and simple effectiveness have simply rendered this approach to the disposal site of history, but the memory still festers and has, to those who were around asphalt at the time, left a lasting bad impression. Fortunately, technology, materials and economic necessity have resulted in extremely efficient, clean machinery and effective techniques for heating asphalt and by addressing these remarks directly we hope to cast a new light on infrared heating!

This technology is the NOT the cure-all of *ALL* asphalt foibles and failures, but it directly addresses the most common cause, namely water-entry and the kaleidoscope of reasons.

So here we go!

“I get a strong smell of asphalt when the heater is operating. It must be damaging the asphalt”

Fallacy: This is exactly the same smell that you get when the paver is laying asphalt and is the result of the volatiles in the binder evaporating, which starts to happen at temperatures as low as 25 degrees C (77F^{o}) but increases in intensity as temperature rises. When heating pavement with infrared, there will be very little in the way of fumes, since most of the volatiles on the surface have already been oxidised or evaporated. When the surface is scarified however, fresh, unoxidised asphalt is exposed and the smell will become stronger since some of the volatiles in the binder are lost. The volatile fraction is less than 10% by mass of the binder and the bulk of the binder remains unaffected. The scarifying and compaction phase lasts less than 5 minutes and mass-tests at Auburn University have shown that the volatile-loss is not discernable and that flexibility and life of the asphalt have not being impacted. Time and motion studies have shown that much more of the volatile fraction is lost during manufacture, transport and laying of the asphalt concrete.

“Infrared heating burns the asphalt and destroys its flexibility and adhesive properties”.

This is an incontrovertible *fact* if your equipment choice and technique is wrong and a *myth* with the right equipment and technique. Yes, incorrect application, temperature and heat-density will indeed cause the asphalt binder to catch alight and burn and this typically happens when the temperature at the surface of the pavement is allowed to exceed 550. Burning does destroy the binder properties but if the heater has the correct mix of heat-density and temperature, the surface temperature will not rise above 400 ^{0} F since the rate of heat transfer into the asphalt below the surface is greater than the rate of heat being applied (temperature equilibrium). The Smartfix asphalt heater is designed with the right mix of flux –density and temperature and actual heating can be discontinued when the temperature 2” below surface attains workability. This is where technique rather than equipment takes over! Obviously a point is reached when the equilibrium is no longer possible and operator training is key!

“**Infrared asphalt heating does not repair a damaged base”**

Fact. Infrared asphalt heating is a process for repairing surface defects and was never intended for going down to the base. However, most base damage that occurs is due to deficiencies at the surface resulting in water-entry which in turn creates a myriad of base-damaging actions like frost-heave and binder-stripping, or sub-base damage due to loss of fines! Infrared can be used to get down to the base to do repairs, but if more than two lifts need to be removed, this simply becomes impractical and conventional cut-and-remove is the solution. Simply put, *a healthy surface promotes a healthy base!*

“Infrared heating can be used to mitigate, rather than repair a damaged base”

Fact. Instances occur where the results of a damaged base, namely heaving, cracking, surface break-up or general unsightliness can be permanently remedied by using infrared heating to repair, level and seal the primary surface-layer. This is a relatively low-cost and effective method of restoring the surface in low-impact, low-load areas where *cosmetics* rather than *functionality* are a greater issue. Typical situations are passenger-car parking lots, abutments, borders and surrounds where business owners like to maintain good appearances outside, which mirrors appearances indoors!

NB: *We would not promote this use of infrared where heavy point-loads from delivery trucks or forklifts reflect much deeper into the asphalt beyond the surface layer.*

Question: **So how would you use infrared in situations where the base is clearly compromised and heavy loads are expected?**

Conventional cut and fill techniques are indicated in these situations, but infrared could be applied post-repair to harmonise asphalt-levels but more importantly, to seal the perimeter and exclude the culprit which caused the failure in the first place!

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