

## Coatings Cool Down Pavements

With their relatively low reflectivity and high thermal capacity, pavement materials tend to retain radiative energy in daytime and slowly release it back into the atmosphere at night. Compared to grassland, average surface temperature of pavements can reach more than 30 °C (54 °F) hotter during summer in Phoenix. High temperature of pavements can lead to increased energy consumption of nearby buildings, intensive outdoor discomfort, and reduction of pavement life and reliability. Applying engineered surface coating over pavements can reduce their temperatures significantly, therefore mitigating the aforementioned adverse effects.

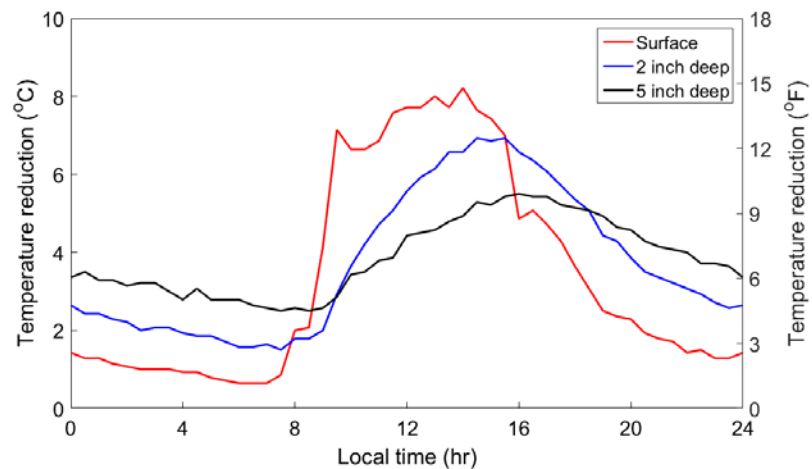
As part of ongoing joint research efforts between Arizona State University's *National Center of Excellence for SMART Innovations*, and Princeton University's *Environmental Fluid Mechanics Research Group*, the research team utilized four pavement slabs (12 x 12 feet) at *Creative Paving Solutions, LLC* in Tempe, Arizona to evaluate their temperature fluctuation. The slabs consisted of hot mix asphalt (HMA), porous hot mix asphalt (PHMA), Portland cement concrete (PCC), and pervious Portland cement concrete (PPCC). A DP-200IR Solar Reflective coating from *Decocoat Polymer Systems, LLC* was applied on all slabs in December 2015. Temperatures at surface, 2 and 5 inches deep have been measured since January 1, 2016.





Surface of (a) HMA, (b) PHMA, (c) PCC, and (d) PPCC

Findings show that the coating can **significantly** cool down all pavement surface and subsurface temperatures. The magnitude varies depending on the pavement type as shown in the table below.



**Maximum coating cooling effect in °C and (°F) on individual pavements in March 2016.**

	Conventional HMA		Porous HMA		Conventional PCC		Porous PCC	
	Day	Night	Day	Night	Day	Night	Day	Night
Surface	8.2 °C (14.8 °F)	1.4 (2.5)	7.4 (13.3)	0.7 (1.3)	5.4 (9.7)	0.1 (0.2)	3.9 (7.0)	-0.2 (-0.4)
2 inch deep	6.9 (12.4)	2.6 (4.7)	3.6 (6.5)	1.9 (3.4)	2.0 (3.6)	0.8 (1.4)	0.7 (1.3)	0.1 (-0.2)
5 inch deep	5.5 (9.9)	3.4 (6.1)	2.6 (4.7)	2.1 (3.8)	1.4 (2.5)	1.0 (1.8)	0.3 (0.5)	0.2 (0.4)