

# DOWN TO THE SURFACE

Surface temperature measurements are critical to ice management treatment decision-making



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**W**hen it comes to treatment type and timing for providing snow and ice control, the most critical factor to consider is surface temperature. Contrary to popular belief, surface temperatures — not air temperatures — actually define treatment type and duration. Are there other factors to consider? Absolutely. However, surface temperatures are major game changers.

## Air versus surface

All too often snow and ice control decisions are based on air temperatures. The information is readily available and frequently reported by local and national weather services. We can even access this information on our smart phones and on many of our vehicle dashboards.

While air temperatures influence surface temperatures, the two can be dramatically different. Making decisions solely based on air temperatures can lead us astray and generate less than desirable outcomes.

Although surface temperatures are critical to good decision-making in snow and ice treatments, that information has not been as readily available or frequently made known. However, we now have the tools and resources that take the guesswork out of gauging when surfaces are prone to freezing and thus offer the opportunity for better decision-

making and the potential for achieving more desirable outcomes.

## Factors impacting surface temps

There can be great disparity between air and surface temperatures at any given location. In addition to air temperatures, surface temperatures are impacted by other factors:

### 1 Subsurface temperatures

Warm subsurface temperatures that typically exist early in the season help the surface maintain heat and can prevent the surface temperature from falling below freezing. A frozen subsurface will promote cooling, drawing heat out of the surface and quickly causing the surface temperature to fall below freezing.

### 2 Solar radiation

The presence or lack of sunshine on a surface will make a major difference in surface temperature. Shaded areas will be cooler than the nonshaded counterpart.

### 3 Cloud cover

While being detrimental during daylight hours and preventing the sun from heating the surface, cloud cover can be advantageous at night since it prevents heat loss from the Earth's surface.

### 4 Traffic

A heavily traveled surface will experience positive impacts from friction.

### 5 Structural composition and type

Different materials and structure types heat and cool differently. A bridge,

garage or elevated surface is impacted by temperatures on all sides and can have temperatures that are very different from the adjacent surface that has a sub-base.

### 6 Moisture in the air

Precipitation falling on a surface will create cooling as can evaporation of moisture.

## Outcomes

Why is surface temperature so important? A few degrees difference in the surface temperature can be the factor in whether a surface is frozen and needs to be treated. It can make the difference between rain and freezing rain and whether frost and black ice will form. It definitely makes a difference in the type of service required, the cost of providing the service and the profit or loss achieved.

It's common to achieve less than desirable outcomes and/or under- or over-apply chemicals without having accurate surface temperature on which to base our decisions. Some examples of scenarios that could be avoided if we had measured surface temperatures:

- We receive an accumulation of snow that we plow and treat all night only to discover an adjacent surface equally clean that has not been serviced. The surface was warm enough to prevent freezing and to promote melting.
- Rain was forecasted to change over to freezing rain; and in an effort to prevent the surface from


freezing and creating bond with the precipitation, chemicals were applied. However, the freezing rain did not occur as quickly as was thought, and the chemicals washed away creating a situation in which we had to reapply.

- Chemicals were applied at the end of the shift to prevent potential refreeze overnight, which never occurred because the surface temperature was above freezing.

- Frost and black ice formed on the surfaces creating hazardous conditions. We would know there is a strong potential for this scenario when monitoring the dew point temperatures and the surface temperatures. When the surface temperature falls below the dew point temperature of the air, condensation begins to occur. If the surface temperature is below freezing, frost will form.

Understanding surface temperature information is important for


winter treatment selection and timing. Knowing this data and the influencing factors will provide needed insight for how to best service any given event. Understanding how to apply this knowledge in your decision-making process can promote resource optimization and increase efficiency and effectiveness, enhance safety, and be the difference between profit and loss.

There are a lot of factors that go into this puzzle. Investing in surface temperature measurement resources and tools is a top priority. Options, education and end user inputs will vary for individual operations; however, the important thing is to understand and apply your knowledge gained to create your own game changer. 

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## SURFACE TEMPERATURE RESOURCES

 Several options for obtaining timely and accurate surface temperature information are available.

**Contract services** – Contract weather service providers offer not only weather forecasting and alert notifications but also pavement/surface forecasting. Government agencies frequently utilize such services, and it may be worthwhile to find out who provides service to your area and if there is an option for contracting with them. Weighing options on contracted services for calculated return on investment can provide valuable insight when considering the use of such services. Remember that this information is a “forecast” and may vary from the actual conditions, however there is confidence in knowing the forecasted information is fact-based and can closely represent conditions likely to occur.