

## Icewick Anti-icing Grate

Innovative Dynamics Inc.  
2560 North Triphammer Rd.  
Ithaca, NY 14850  
Contact: Joseph Gerardi  
Telephone: 607-257-0533  
Fax: 607-257-0516  
E-mail: [idi@idiny.com](mailto:idi@idiny.com)  
<http://www.idiny.com/>

**Intended or Actual Application:** Innovative Dynamics, Inc. (IDI 2007) has developed a system called the Icewick Grate to create an anti-icing and anti-slip surface for marine and non-marine applications (Figure 17). The Icewick grate surface consists of a robust grating or tiles that wick an anti-icing fluid to the icing-prone surface from a reservoir layer located beneath. Icewick is designed for use on walkways, stairs, and in work areas. The system is passive and self-regulating. Fluid can be supplied from a remote location by pump if necessary.

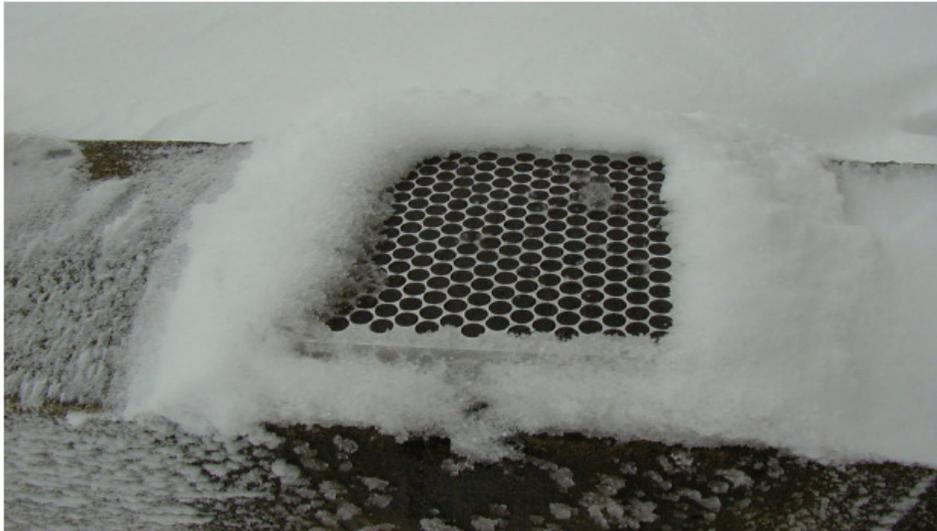


Figure 17. Icewick Anti-icing Grate prototype melting snow (IDI 2007) .

**Operating Environment:** The Icewick Grate was designed for ship decks and other non-marine surfaces. It has been tested successfully in snow and freshwater ice. The system will operate in temperatures as low as the chemical freezing-point depressant used in the system.

**Engineering Concept:** The Icewick Grate exploits wicking action, which utilizes a porous material such as Ice, open-cell rigid foam, or a porous ceramic that is incorporated within an anti-slip grating or tile matrix. Wicks can be placed in the cavities of a grate or in holes in a tile, or use homogeneous porous materials. The bases of the wicks are submerged in the anti-icing fluid such that it is drawn to the top surface of the wick. Thus, the formation of ice or accumulation of snow is prevented.

A reservoir system feeds all of the wicks, and this can be comprised of a dedicated layer and/or be tied into an adjacent or remote reservoir via pumping. Recessing the wicks immediately below the surface of a grating allows the fluid to reach the icing substrate yet minimizing tracking.

A key capability of the system is that the melt-water can be absorbed along with the diluted anti-icing fluid, rather than flowing to adjacent surfaces where it could cause other problems. Also, due to the naturally intermittent nature of icing events, the large surface area of the system will evaporate the melt-water. Thus, the full potency of the anti-icing fluid is maintained, and the melt-water is disposed of.

The Icewick Anti-icing Grate has been tested with potassium acetate, which is a highly effective freezing point depressant. Its hygroscopic nature maintains the appropriate chemical potency in a changing moisture environment. It cannot dry out or over-dilute from humidity. Potassium acetate has a sufficiently low corrosivity so that it can be used on aircraft runways as well; it is applied as a liquid to temperatures as low as  $-29^{\circ}\text{C}$ .

**TRL:** 6. Lab testing has occurred in winter snow and ice conditions.

**Deicing or Anti-icing:** Anti-icing.

**Current Advantages and Disadvantages:** The Icewick Anti-icing Grate protects walkways, stairs, and potentially landing pads. The system requires level surfaces for optimal operation. The system consumes fluid, though slowly, so replenishment would be needed. Extreme cases of precipitation or wave wash could over-dilute the fluid to render the system momentarily ineffective. IDI indicates that the system is damage tolerant and would continue to be effective if punctured or otherwise damaged. The Icewick Grate is about 2.5-cm thick, but this will depend on the reservoir capacity and performance requirements. Thicker versions can absorb

more melt-water, and perform longer without replenishment, but the space may not be available.

**Current Acquisition Cost:** Unknown, in development.

**Operational Cost:** Function of performance level.

**Maintenance Requirements:** None other than fluid replenishment. Wicks may need to be back-flushed if performing in a dusty environment.

**Potential Marine Application and Safety Enhancement:** The Icewick Anti-icing Grate may be effective on walkways, stairs, ship decks, and work areas. It may also be applicable to helicopter landing pads. Icewick technology would improve the safety of individuals, groups of personnel, and possibly helicopter flight operations.

**Marine TRL:** 5.

**Marine Advantages and Disadvantages:** System may be diluted by sea spray. System would protect only horizontal surfaces such as decks, walkways, stairs, and perhaps helicopter landing pad. Effects of saline spray on anti-icing fluid is unknown. System presents no electrical or explosive hazards. System has low complexity, suggesting low cost and low maintenance requirements. System is largely passive except for need to replenish fluid.

**Marine Technology Transfer Requirements:** Evaluate system in saline ice and spray conditions. Evaluate system on deck of pitching supply boat. Experiment with a variety of wicking designs to determine most effective system in industrial environment. Explore effects of chemical and oil on system effectiveness and longevity. In addition, the slipperiness of the anti-icing fluids should be investigated if tracked onto smooth surfaces.