

# Research on the effect of airport deicing agent on pavement performance of asphalt concrete

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**Abstract.** As the simplest and most effective method to remove ice and snow in winter, deicing agent provides guarantee for air traffic operation and safety. In addition to the extensive use of ice agents in improving the operation efficiency of the airport, it also causes environmental pollution, airport asphalt pavement damage and corrosion of ancillary facilities. Based on the asphalt runway and pavement project of an airport in China, this paper focuses on the analysis of the effect of the airport deicing agent on the pavement performance of asphalt concrete, so as to carry out the targeted disposal in the construction quality.

## 1. Introduction

As the simplest and effective method to remove ice and snow in winter, it provides guarantee for air traffic operation and safety, and is also recognized by domestic and foreign researchers. But a large quantity of spraying and ignores the influence of pavement, deicing agent through melting snow and ice penetration into the asphalt concrete, after repeated cycle of high and low temperature and other factors can result in asphalt concrete asphalt layer above the lower bonding, increase aggregate peeling, affect its durability.

In addition to the composition of ice cream, it can reduce the freezing point and thus achieve the purpose of natural melting and ice melting. Currently, the commonly used ice - removing agent in the airport is formate, acetate, etc.

## 2. Study on the influence of deicing agent on asphalt performance

### 2.1 *The effect of deicing agent on asphalt and aggregates interface*

Interactions between asphalt and aggregate structure of asphalt mixture is formed by the decisive factor, it is directly related to the strength of the asphalt mixture, temperature stability, water stability and aging speed and a series of major performance.

Deicing agent improve the performance of asphalt mixture stripping, lead to spalling rate increase, will significantly accelerate the concrete alkaline aggregate reaction, which can soften, asphalt binder on the runway asphalt mixture phenomenon such as flaking and loose gravel, influence the asphalt road surface function and durability.



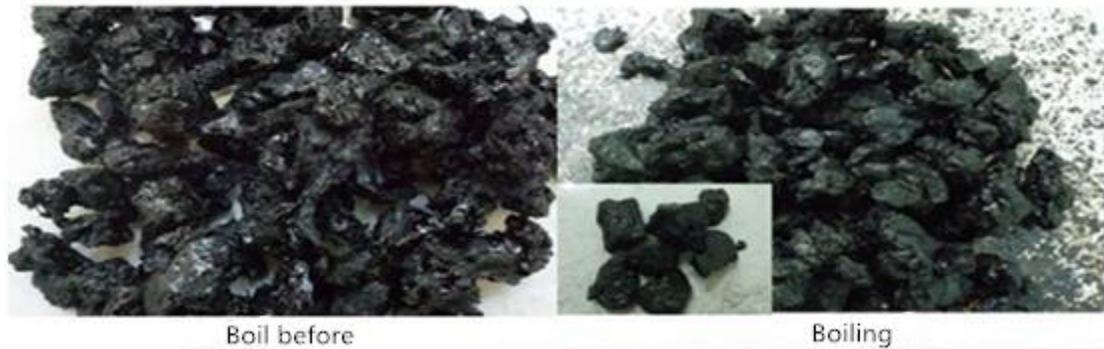


Figure 1 After the deicing agent is boiling to the asphalt mixture



Figure 2 Asphalt at 60 °C in aqueous solution, suspension after test

Polarity of asphalt and aggregate interface formed by the composition of the aggregate surface, so the loss of the polar components in asphalt will be led to the decrease of the bond between asphalt and aggregate, and eventually increase the loss of adhesion of asphalt concrete pavement.

### 2.2 The effect of deicing agent on high temperature performance of asphalt mixture

The characteristic of asphalt mixture is that the strength and resistance to deformation change with temperature. During the use of asphalt pavement, the test of environmental conditions from low temperature to high temperature is to be tested. High temperature stability is the ability of asphalt mixture to resist permanent deformation under load.



Figure 3 IDT sample and uniaxial sample failure state

This article through to the deicing agent simulation test is studied, with the effects of the asphalt SHRP test method is then used for deicing agent role before and after high temperature properties of asphalt test, as the temperature increases, the influence degree of the deicing agent high temperature performance of asphalt in gradually increasing, but small, concentration of deicing agent have an impact on the role of asphalt, the influence law changes according to the deicing agent type.

### 2.3 The effect of deicing agent on the low temperature performance of asphalt mixture

Evaluation of low temperature performance of asphalt mixture at present, there are mainly the indirect tensile test, direct tensile test, creep test, restricted temperature stress test specimens, tm specimen bending test, the stress relaxation test, etc. In combination with the actual conditions, this study used the low-temperature bending test of the small beam to study the effect of ice-free agent on the low temperature performance of asphalt mixture.



Figure 4 Small beam specimen and bending test

Test temperature - 10 °C and 0 °C, respectively, each test temperature corresponding to the four groups, each group of experiments of four specimens, the test loading rate of 50 mm/min, arbitrary load moment in loading process by test calculation of stress, strain and stiffness modulus method as above, just read on the load and deformation of the moment instead of the maximum load and failure strain.

Low temperature bending test research shows that the influence of the deicing agent for asphalt mixture performance changes significantly, freezing and thawing cycles on the flexural tensile strength of asphalt produced great influence, with the increase of number of flexural tensile strength will reduce further, and different types have different deicing agent declines. For flexural tensile strain index, freezing and thawing cycles of value influence degree about deicing agent type, the bending stiffness modulus index SB, freezing and thawing cycles on SB value influence degree is related to deicer type.

### 2.4 The effect of deicing agent on the water stability of asphalt mixture

Freeze-thaw splitting strength than as an important index evaluation of water damage of asphalt mixture, this paper will through the asphalt mixture freeze-thaw splitting test, combined with the change of the asphalt mixture and the concentration of the void fraction conditions, analysis of comparative study deicer impact on water stability of asphalt mixture.

Deicing agent for affected the water stability of asphalt mixture, under the condition of different concentrations, the void fraction of deicing agent is not the same change trend, influence on freeze-thaw splitting freeze-thaw splitting strength with the increase of the concentration showed a trend of decrease the increase, then the concentration of 2% is a maximum, but in the concentration has a minimum value is 0%, show deicing agent within the scope of the void fraction of asphalt mixture water stability is improved.

## 3 Conclusion

(1) The addition of ice agent can significantly accelerate the reaction of the alkaline aggregate of concrete, resulting in the softening of asphalt mixture on the runway, the peeling of asphalt mixture and the loose gravel.

(2) The influence degree of deicing agent on the high temperature performance of asphalt is gradually increasing, but the increase is small, and the effect of the concentration of deicing agent on asphalt is affected, and the influence rule varies with the type of ice agent.

(3) The effect of deicing agent on the low temperature performance of asphalt is related to the type and concentration of the deicer.

(4) The deicing agent on performance of asphalt mixture water stability under the condition of different concentrations, the void fraction of deicing agent is not the same change trend, influence on freeze-thaw splitting freeze-thaw splitting strength with the increase of the concentration showed a trend of decrease the increase then.

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