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Economic Evaluation of Hydronic Heated Airport Pavements

Objectives

- To develop economic analysis framework to identify advantages of a heated pavement including operational savings and improved safety
- The outcome of this study will provide an approach to decision making regarding whether or not to install heated pavement system, along with benefits to safety, accessibility, operating efficiency and sustainability to the airport

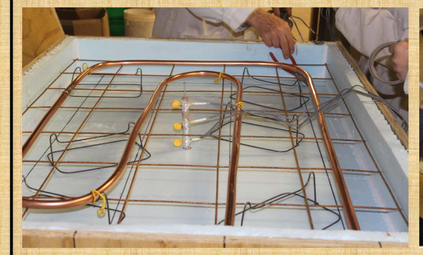
Background

Heated pavement provides an *environmentally safe alternative* to melt snow and ice without the need for deicing chemicals (e.g., road salt) and snowplowing vehicles

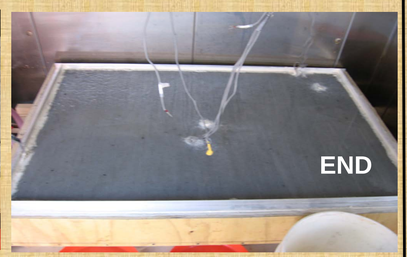
Hydronic Heated Pavement Systems

Circulate heat transfer fluid (water, a mix of water, and anti-freeze agent such as propylene glycol) in a "closed loop" between pavement and heating source (boiler, geothermal, etc.)

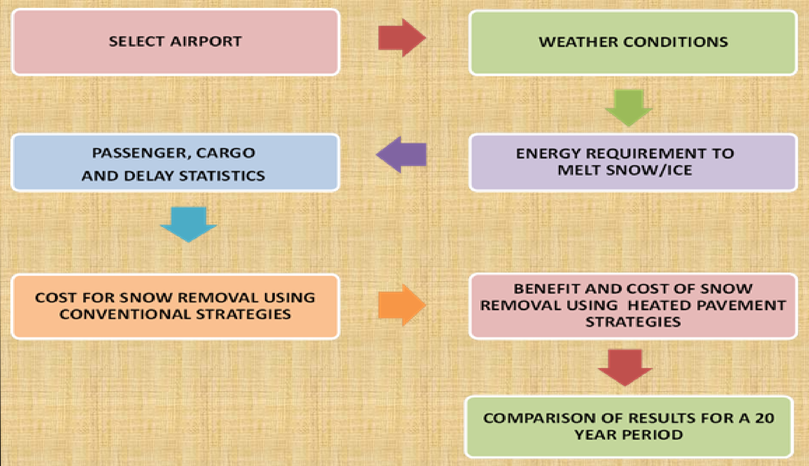
Construction




Testing



Research Approach



Stakeholders Involved

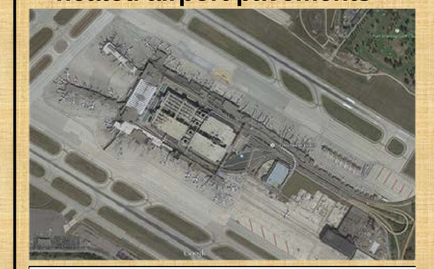
- FAA: Provides capital
- General Public: Reaps benefits such as lesser waiting times, lesser delays, loss of travel time
- Airport Authority: Part of the initial capital investment, increase in the no. of winter operations, enhanced safety, maintenance costs
- Airlines: On-time performance, reduction in the loss of fuel and crew hours, higher market value

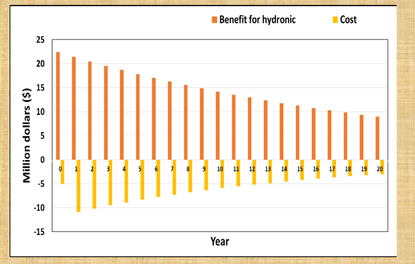
Cost Comparison Methodology

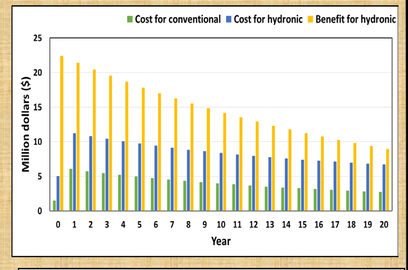
Cost/Benefit category	Conventional	Heated pavement
Initial cost	Snow removal equipment purchase	Heating system installation
Operation cost	Labor , fuel, and deicing agents	Energy source cost (geo-thermal energy, fuel, natural gas, and etc.)
Maintenance cost	Maintenance for system	Maintenance for system
Soft / Indirect cost	Aircraft, passenger, and cargo delay costs, loss of daily operation revenue and landing fee.	Aircraft, passenger, and cargo delay costs are minimized. Enhanced safety and better working conditions

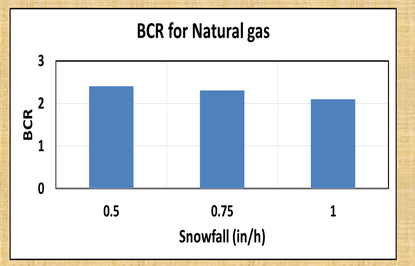
BCA Results: Case Study

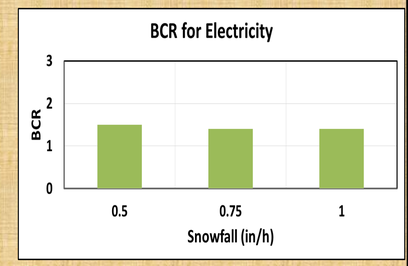
A case study was carried out for the *Minneapolis-St. Paul International Airport, MN* to verify the feasibility of hydronic heated airport pavements









Key Findings

- *High cost of installation of heated pavement systems can be justified under the given assumptions*
- *The benefits associated with hydronic heated pavement systems far outweigh the costs involved*
- *The annualized costs of conventional snow removal strategies are lower but the high benefits from hydronic heated pavement systems make the project feasible*
- *Natural gas is the preferred energy operation source*

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