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Room: D

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Presentation title:

TOWARDS SUSTAINABLE WINTER ROAD MAINTENANCE : DEVELOPMENT OF ICE-BREAKING PAVEMENT

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Summary:

Asphalt has played an important role in our infrastructure over the years. It supports economic, as well as social, activities within our transport infrastructure. Recently, however, demand for asphalt paving has changed due to growing global awareness of climate change. This issue has become more pronounced worldwide, even in winter. Severe snowfall afflicted Russia; Jerusalem was pounded by a blizzard; the coldest winter in thirty years was recorded in China; and an unusually low-pressure system known as a "bomb cyclone" snarled traffic in Japan. Such extreme events devastate the transport infrastructure despite diminished maintenance budgets due to the recent financial climate. In addition, as regards roads, conventional anti-icing measures using chemicals such as salt tend to exhibit declining performance over time. Therefore, winter road maintenance is an important challenge, in terms of both sustainability and road safety. In order to tackle this problem from a paving perspective, ice-breaking pavement technology has been developed to achieve the following benefits: prevention of ice build-up on roads, mitigation of environmental impact, and reduction in traffic accidents. This paper describes the practical and environmental effects of ice-breaking pavement technology through its development and application, with the following conclusions being drawn from this study. With regard to serviceability, laboratory and field tests show that any ice forming on the road surface is effectively crushed due to the flexing of rolled rubber aggregate chips at the surface. Also, the potential to reduce traffic accidents using this technology has been demonstrated from its field application. In terms of practical considerations, a computer simulation using Finite Element analysis explains the mechanism for the ice-layer breakage and the design details, such as the appropriate amount of rubber aggregate to use. With respect to mitigation of environmental impact, field monitoring reveals that the ice-breaking pavement retains good surface condition and performance even after three years; and it is likely to be useful in mitigating environmental damage, as no chemical materials are applied to the road surface. Finally, a life cycle analysis based on its field application shows that use of the ice-breaking pavement technology is an effective measure for sustainable winter road maintenance, since its life cycle cost is more economic under conventional operation.