Energy efficient and reliable operation of railway switches and crossings during winter - the fixed link across Great Belt as case

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INTRODUCTION

During winter times ice and compressed snow can cause problems with the operation of the switches, which can cause delays spread in the railway network. Removing ice or compressed snow is crucial to operation during winter times, but the current methods are inefficient and energy consummating. This project will have the fixed link across the Great Belt as case, but most of the solutions, can be applied to the national railway network, if not already existing there. On a yearly basis, A/S Storebælt uses 900.000 kWh on heating their 37 switches, meaning that there is a lot to be saved, if heating and removing the ice and snow can be made more effective.

THEORY

The chunks of ice will most frequently come from underneath the trains. When going through switches, the vibrations can cause chunks of ice, coming from underneath the trains to fall off and into the switch, preventing it from operating reliably. Today, the switches are heated by heating units placed on the foot of the rails, by clips. The fixed link across the Great Belt has 37 switches located in Nyborg, Korsør and on Sprogø, and the structure of the system entails that either all or none of the heating units at one station are switched on.

METHODS

There are several methods for avoiding ice and snow in the railway switches. In the project we investigated a few of these methods. The systems investigated are

- System 80, currently in use on the fixed links across the Great Belt
- System 2000, currently in use on most of the national railway network
- A Swedish induction system that A/S Storebælt is currently considering

These systems are also considered in some combinations with surveillance of the switches in order to remove ice or snow, only when necessary.

RESULTS

The induction system on combination with increased surveillance will definitely make operation of the switches more energy efficient, as the heat will only be turned on, when necessary. Up to 70% of the switches are not used during daily operations, and since the induction system can heat just one side of the switch, up to 85% of the time a heating element is on, can be saved, if the heat is only turned on, when necessary.

CONCLUSION

There are definitely improvements to be made on the energy consumption used by A/S Storebælt for ensuring that the operation of switches is energy efficient and reliable. Our estimated energy conservation is approximately 500.000 kWh per year at the Great Belt.