

Australian Bridge Deck Heating System Controlled by Vaisala Ice Detection

Australia – “a land of sweeping plains, of ragged mountain ranges, of droughts and flooding rains”. No mention of frost, ice nor snow in the iconic poem by Dorothea McKellar dedicated to a country that is known around the world for warm weather and fine beaches. However, each winter in the south eastern states of Australia, the climate is conducive to a combination of marginal winter weather conditions which present hazardous road conditions for drivers.

In Victoria, the Great Dividing Range winds from the north east down to the south west providing extended regions of up to 600 meters in elevation that major roads traverse. One such road is the Calder Freeway; the main arterial between Melbourne and Bendigo, with average daily vehicle volumes exceeding 10,000 vehicles per day.

The roads in the Calder corridor have been upgraded and improved in a number of ways over the years, culminating in the dual carriage Calder Freeway that serves the area today.

Prior to the current Calder Freeway, the old Calder Highway wound its way through numerous country towns on its way north to Bendigo. To the south of Woodend, it passes through the Black Forest, the most eastern section of the Wombat State Forest. It was here that the first Vaisala Ice Warning systems were installed in 1989, utilising pavement



The bridge deck heating coils were installed during construction

based road sensors. The systems are still in operation today, activating local warning signs to alert drivers of hazardous conditions.

Ice Detection and Control System to Determine Hazardous Conditions

The winter conditions were taken into account during the design of the new Calder Freeway. VicRoads, the highway department for the state of Victoria, installed bridge deck heating in eight dual span bridges in the Macedon to Kyneton section of the Freeway during the construction phase.

The Bridge Deck Heating consists of three separate heating coils that are laid into the base of the bridge deck prior to the construction of the road surface. A heating control system is then used to manage the delivery of up to 160 Kwatts of heating per bridge deck to prevent and remove frost, ice and snow hazards from the bridge decks. The heating control system determines how many of the heating coils to apply power to and for what period of time heating is required.

In 2008, Vaisala was contracted by VicRoads to implement an ice detection and control system to determine the onset of hazardous conditions, activate driver advisory warning signs, and manage the heating control. Whilst the system is completely autonomous, it also communicates with VicRoads Traffic Management Centre (TMC) to enable the current status of detection, warning signs and heating to be available throughout the organisation.

Benefits from Remote Sensors and Configurable Processing Unit

Implementing ice detection on the heated bridge decks with traditional pavement based sensors was difficult due to the presence of the embedded heating loops. Vaisala's



Warning signs along the Calder Freeway alert drivers on icy conditions.

non-invasive road weather sensors (Vaisala Remote Road Surface State Sensor DSC111) were chosen to avoid causing damage to the heating coils.

The project began in March 2008. During the first winter, the system was installed and commissioned, and the collection of data began. An optimisation phase followed, during which the gathered data was analysed and used to adjust the software configuration prior to winter 2009.

A total of 13 detection sites were installed, each connected to a processing unit (Vaisala HydroMet™ System MAWS110), which uses the sensor data to activate the appropriate heat setting from a three-stage heating system.

The configurability of the MAWS110 enabled a number of important features to be implemented, such as VicRoads RMS communication protocol between the field sites and the Traffic Management Centre, the capability to log one minute road weather conditions, sign and heating status on site for the entire winter, and integrating existing embedded temperature sensors to the system.

Final Outcome: Vital Improvement to Local Road Conditions

Due to the customised nature of the system, comprehensive documen-

tation and testing was a given.

Throughout the project, Vaisala acted as the central co-ordination point between the electrical contractor, VicRoads Regional Office, VicRoads Traffic Management Centre and VicRoads ITS project group.

Extensive system testing was also carried out by the VicRoads Northern Region office, with numerous field staff involved in the checking of sign and heating operation.

In summarising the project and its outcomes, the VicRoads Northern Region states:

“The scope of the project was to refurbish the existing system in 2008 and to deliver a reliable and stable Ice Warning System. The improvements provided by the Vaisala technology and its importance to the Calder corridor cannot be underestimated. The solution, including ice detection, automatic warning sign and bridge deck heating operation, is providing all road users with reliable and up to the minute information about the local road condition.”

“The value of having such systems in place, especially during winter when adverse weather conditions in the vicinity of the Calder corridor are high during the colder months, is vital for the confidence of the local communities, as well as all road users.”