Geothermal anti-icing system under investigation

A research project in Norway is investigating whether geothermal energy can be used to keep bridges free of ice in the winter, with the intention of reducing the use of salt and grit on highways.

The research is being done by Josef Johnsson at Chalmers Technical University in Sweden, in collaboration with the E39 ferry-free project in Norway. Johnsson has built a full-scale test track in Østersund in Sweden and is eagerly anticipating the arrival of the winter weather to begin his testing programme.

Johnsson's research is focussed on developing a system for small bridges, of which there are many on the coastal route in Norway, rather than on the proposed long-span fjord crossings.

The climate in Norway is unpredictable and highly changeable, and it can only take minutes for a thin layer of ice to form on roads and particularly bridges, creating hazardous conditions for drivers.

While the application of salt and grit is traditionally used to treat highways, the drawbacks of this method are recognised especially in relation to the corrosion they cause to steel bridges and bridge elements. Johnsson also points out the impact that the excessive use of salt can have on the environment. Salting and gritting near water is a particular threat, as it pollutes the ecosystem and sources of drinking water.

He is investigating the options for exploiting geothermal energy from boreholes, extracting it and circulating it through a system of pipes cast into the bridge deck to prevent it from freezing. The system of embedded pipes in the road is known as a hydronic heating pavement. Energy is harvested in the summer and saved in seasonal thermal energy storages; in the winter it is released into the pipes to melt the snow or ice. Johnsson's study will investigate the anti-icing performance of the system during cold periods.

At the test track in Østersund the pipes are cast into a highway pavement, but Johnsson says would be a simple procedure to adapt it to a bridge, since it is easier to control boundary conditions, and problems related to the freezing of the subsoil could be eliminated. The current system is only suitable for short span structures because it increases the weight of the bridge.

Over the winter Johnsson will be testing various surface solutions and different types of renewable energy on his test track.

COLOMBIAN CATCH-UP

The first 70m-long concrete deck pour on one of Colombia's longest bridges took place at the beginning of October and the contractor hopes that the use of MSS technology will help recoup a 10% project delay.

The completion target of July 2018 for the Alberto Pumarejo Bridge is looking uncertain following an announcement by Colombia's National Roads Institute that the project was three months behind schedule.

The cable-stayed Pumarejo Bridge will connect the town of Barranquilla with Salamanca Island in north Colombia over the River Magadalena, around 20km south of the Pacific Ocean. Work started on the structure in 2015 by the consortium

The MSS is being operated by Construgomes

SES Puente Magdalena, formed by Esgamo Ingenieros Constructores, Sacyr Chile and Sacyr Construcción Colombia.

The main structure is 2,250m long, plus 990m of access viaducts; the main span is 380m long between two 80m-high towers. The prestressed concrete bridge is 38.2m wide and consists of six vehicular lanes, two pedestrian lanes and two cycle routes.

Around 1,190m of bridge superstructure is being built using M1-70-S and CM-15 formwork systems from specialist manufacturer Berd. An overhead movable scaffolding system is being used to build 17 central superstructure sections, each 70m long and 16m wide, and weighing 2,700t. The two 11.1m-wide lateral sections will be constructed using a 38.2m-wide wing traveller, which will be assembled in the next few weeks. According to Berd, once work on site is optimised, 14-day cycle times are achievable for each span of the US$221-million bridge. At the time of going to press work had started on a second span.