

The Importance of Quality Control of Road Station Data by MESAN. A Product Delivered to The Swedish National Road Administration from SMHI.

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Introduction

Traffic accidents are extremely costly, not only to the individual victims, but also to society at large. Slippery road conditions constitute a major contributory factor to many road accidents. To minimize the society costs the winter road maintenance organization needs a lot of support.

The Swedish RWIS, including 250 information centers and around 1000 users, is built up in collaboration with four partners, and one of them is the Swedish Meteorological and Hydrological Institute, SMHI.

The Swedish National Road Administration, SNRA and SMHI have worked together during almost three decades. In the beginning SMHI delivered simple forecasts by telephone. But when the demands were raised for higher quality of road maintenance work, SMHI had to deliver more tailored products. This development has been going on in a very deep co-operation to get the most useful products.

Since the beginning of the nineties the maintenance task is carried out both by the Production Division of SNRA and private contractors. In this competition the demands on good weather information has increased. SNRA as a customer of the winter service is very aware of this situation and has therefore made big efforts to have high quality of the road station data. This data has an important role of many aspects. At first the maintenance people use this information to start actions, secondly it is used to follow up performed actions for adjusting the financial settlements. SNRA is very anxious for the expenses of the winter maintenance to be paid correctly.

Therefore SNRA, and SMHI, have started some projects together where mesoscale analyses, MESAN, have had great importance. It is from the situation on the Swedish winter road maintenance market these desires have come up.

Quality control

To know when a maintenance action has to be done, SNRA has defined a number of weather situations based on data from the road stations. As these situations are dependent on correct information, all road stations are gone through a quality test at SMHI. The air temperature and air humidity data collected from the 650 road stations the latest 24 hours are controlled. All stations with an unacceptable deviation from the mesoscale analysis are listed and presented both in a table and in a map. In the map presentation the "wrong" observations are plotted in the mesoscale analysis from the corresponding situation. The service people at SNRA use this information to improve the quality of the road stations. They easily find when a sensor has to be adjusted or changed. It is important that the station data is correct in the verification of different weather situations. With incorrect humidity data the dew point will be wrong. That leads to, in the comparison between the surface temperature and the dew points temperature, that a situation with rime can be missed as well as a preventive action can be unnecessarily done.

The current winter we have extended the verification to road surface temperature data and precipitation data. Experiences from the mesoscale analyses show that if the precipitation sensors show dry weather in a snowfall, that false information rapidly spoils the calculation of the new fallen snow in respective area.

As precipitation is a discontinuous parameter it is more complicated to point out wrong information, but by using 24 hours periods for the verification we hope to be successful. Concerning the road surface temperature there is a risk that correct data can be pointed out as false because in a clear air situations the surface temperature can vary a lot along a road. The advantage of automatic control is that all data can be checked easily compared with a manual control.

Snow and wind analyses

One problem is to get a good picture of the amount of new fallen snow when an area of precipitation has passed. As the spacing between the road stations often is too wide it is difficult to get a good picture of the snow situation. By using mesoscale analyses SMHI helps SNRA to get the best basic data as possible. From this analysis it is possible to get realistic snow information from 11x 11- km areas.

In the mesoscale analysis, at SMHI called MESAN, the HIRLAM model, all SMHI observations, road station observations and radar information are used. HIRLAM is the shortening for **high resolution limited area modeling**. The advantage of the MESAN analyses is, that several types of input data is used and that results in a much better product. Every third hour a preliminary information from 3856 areas is delivered to SNRA. Once a month a final analysis is produced. These analyses can also be shown in a map presentation. In four maps the accumulated new fallen snow from the latest 3, 6, 12 and 24 hours can be presented. As the maintenance districts have become wider the supervising staff get a good view of the current snow situation from these maps. The analyses are produced every third hour around the clock.

Another difficulty is to verify situations with drifting snow because every road station is not equipped with wind sensors. Besides some sensors are also sheltered from the wind. But by using wind analyses from MESAN it is possible to put wind information on every grid area where snow has fallen. This will represent wind-exposed roads in the grid area. Both the maximum and average wind speeds can be used in the analysis system.

Many of the MESAN products can be produced in real time and help the maintenance people to get a good picture of the current situation.

Summary

Close co-operation between road authorities and a national meteorological institute or private company is of vital importance. Together SMHI and SNRA have developed a comprehensive weather information system with a number of tailored meteorological products. The Swedish RWiS is nation wide and used for planning, realisation and following up winter road maintenance actions. The greatest advantage with this RWiS is that all information is in one system. The users can pick up current data, statistics, forecasts, radar and satellite images, road camera images and so on. The reason for the good results of meteorological point of view is a close relationship between meteorologists and the different users at SNRA.

A result of the deep co-operation between SNRA and Swedish Meteorological and Hydrological Institute is the quality control. It is of greatest importance to have high quality on the road station data and all the information used in the verification stage of the maintenance actions. For that purpose SMHI has supported with important contributions.

In addition to reducing the number of accidents this system saves money through the more efficient organization of road maintenance and reduced use of chemicals. Fewer chemicals mean reduced operating costs, reduced corrosive damages on vehicles as well as reduced environmental impact. The complete RWiS concept has been calculated to save SNRA 3 times the annual cost.