

Training programme for users of the Swedish Road Weather Information System

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Abstract

This paper will describe how the training programme for users of the road weather information system is built up in Sweden. Today the facilities to do efficient winter road maintenance work are continuously improved. Concurrently with the extended amount of information in the system, it is becoming more and more important to teach the users how to use the tools. Otherwise this support has no value.

In the Swedish system you can find a lot of information, present data as well as different forecasts. The road station information is the basis of the system. Without a training in the understanding of what the different parameters from the road station sensors show, it is impossible to use the system efficiently. In other words that means: "To do the right thing at the right time". This saves money to society and saves the environment.

In the menu of different present information, images from weather radars and satellites are available. How can the maintenance people take advantage of this information? When is it true, when is it false? With better knowledge about the advantages and disadvantages of these sources of information, it is possible to use them more properly.

It is also important to understand the weather forecasts to plan the coming maintenance activities in the right way. Every weather situation affects the road surface conditions in a special way. By knowing how, it is easier to find the warning signals from present information and to activate the maintenance people at the right time. Depending on where in the maintenance organization people work, they can choose to participate in workshops of two levels, one basic or one more advanced. The advanced workshop is specially tailored for supervisors at maintenance offices.

1. Introduction

The Swedish Road Weather Information System, RWiS, is a very comprehensive system with a lot of information. It is primarily built up as a support to the winter road maintenance people but will in the future also be used for other applications like traffic information and environmental measurements. The staff at supervising offices, the maintenance people in the field, and the people at traffic information offices for drivers, are all connected to RWiS, which today consists of around 200 units with approximately 800 users.

The RWiS is a Windows-based PC-system. To handle this tool, a lot of training is needed in how to find and use all information. To make it easier "to make the right decisions at the right time" it is important to know the possibilities for generating an optimal mix of road station data and images from radars and satellites.

In most countries the roles of the road authorities and the meteorological institutes is slightly different. In Sweden, the meteorologists support the maintenance staff with information and guidance in weather related questions but only have a smaller role in giving recommendations to road maintenance activities. To be successful in this cooperation it is necessary to know how the other part works and what kind of problem they have to face. Therefore, the meteorologists are taught winter maintenance problems by teachers from the road authorities and the maintenance people are taught by meteorologists how to use the meteorological information.

This paper will give a presentation of the training programme for winter road maintenance people with the main point on meteorology. There are two levels of training courses, one basic and one more advanced. The basic level is tailored for managers of field crew and people who later intend to work in supervising offices, and the advanced level is mainly geared for supervisors.

2. The information

The information delivered to the RWiS comes from around 600 road stations owned by SNRA, Swedish National Road Administration, and from SMHI, Swedish Meteorological and Hydrological Institute. The meteorological institute sends forecasts and images from weather

radars and weather satellites. All information is supposed to help the maintenance organization to be better prepared for all the dangerous situations which cause slippery roads. To be successful in maintenance activities it is necessary to have a fundamental knowledge in elementary meteorology, local climate and micro climate conditions, that is in this case road climate. A lot of emphasis is placed on the interpretation of weather observations and forecasts and how the weather effects road conditions.

3. The users

The owner and main user of the RWiS is the Swedish National Road Administration, SNRA. In its organization the information today is mainly used for winter road maintenance and for traffic service to drivers. But tomorrow it also can be used to give information about how traffic is flowing.

In winter maintenance work there are two categories of users:

- the field staff
- the supervisors at regional offices.

In the first group, working with maintenance activities, the road managers have access to the information system. His or her task is to decide when and where the crew is to be put in and what to do. With RWiS they have an excellent tool, if they understand the information and can take advantage of it. It is specially for preventive activities that the system has its advantages. In most cases it is possible to prevent slipperiness, which saves money as well as the environment. But of course it is a good help in snow ploughing, too.

To use the field crew efficiently they are only activated when needed. Therefore some regional supervising offices, open 24 hours a day, are built up. From there well trained supervising managers lead or initiate the maintenance work and recommend appropriate actions. The people giving information to drivers of course use the RWiS. They can directly give information on the present road conditions and what is expected. This information about the roads is also delivered to local radio stations.

4. The basic workshop

The basic workshop is divided into 3 sessions. In the first one, information is given about the RWiS; how it is built up, the road stations and the quality of distributed data. It is an advantage if the participants have previous knowledge in handling the Windows operating system, because in the next session they are trained in generating different products, for example, maps of a special selection of road stations and different alerts. In the third session all attention is paid to the "meteorological part" with a lot of exercises.

4.1 A popular introduction to meteorology

To obtain a background to the following lectures, a popular introduction to meteorology is given. We explain the atmospheric circulation systems, and air masses and their different properties. We explain a lot of meteorological expressions like; what is a Low or a High, a warm front and a cold front, and how different types of clouds and precipitation are formed.

4.2 Water in the atmosphere

Water in one of its three stages (vapor, liquid and solid) is always a factor contributing to slippery roads. Therefore it is important to understand how water is available in the atmosphere and how it can be released. The road weather stations deliver among other things data showing air temperature, dew point temperature, relative humidity and road surface temperature. A lot of time is spent explaining the relationship between these parameters and what information they give about the humidity in the air. After that lecture every course member knows why dew or frost is released on the road surface and in which situations it can happen.

With this background it is time to inform about the radiation balance and its effects on the road surface temperature and the air temperature, and why they often differ. It is not obvious why ice can be formed on the roads with air temperatures several degrees centigrade above zero.

4.3 Local climate

Almost all winter maintenance people know that there are a lot of dangerous stretches of road where slippery spots usually form. The theory of the radiation balance together with topographical features explain why local climate differences arise. A clear sky results in one kind of local climate, overcast sky another. But it is also important to know that the heating or cooling

of the road surface does not only depend on the local climate but also how the roads are constructed. Another factor that affects the road surface temperature is the traffic intensity. Now it is easier to understand why slipperiness is formed in different sections of the roads in different weather situations. Typical spots are: valleys with cold air, bridges, forests, shaded sections, high situated sections, near waters and so on. Sometimes an exchange of air mass is enough to generate slippery roads, another day precipitation produces the same effects. We analyse the weather situations in which these dangerous factors can be found.

4.4 What does the weather forecast say

After the local climate lecture, users of the weather forecasts look at the information with new eyes, that is in terms of risks of slippery roads. Will frost or black ice be formed? Will there be any snow, and what weather will follow the snow? Will drifting snow be a problem in any area? And so on.

A cross section of a frontal system is shown with the typical curves for air temperature, dew point and road surface temperatures. Every time a frontal system passes, these curves show the same essential features.

4.5 Radar and satellite images

Once or twice an hour radar composite and satellite images are delivered to the RWiS. Often these images help the maintenance people in their work. But there are situations when they give false information. For example, when the radar beams miss precipitation falling from lower clouds far away from the radar station. In inversions generated in areas with high pressure, strong precipitation echoes can appear even though the weather is dry and clear. Therefore, it is very important to teach the advantages and disadvantages of the images and why it is necessary to use all information in the system to eliminate the risk of making serious mistakes.

4.6. Exercises

Every day a lot of weather charts and worded forecasts are delivered to the road authorities. To find out if the course members have understood how to take care of all forecast information they have to practice a lot by themselves. They have to analyse some classical dangerous weather situations and find out the risks of slippery roads, what kind of slipperiness can be expected, in which area it will first appear and which road stations will give the first warning

signals. They also have to suggest an appropriate maintenance action. These exercises are very useful and appreciated. The workshop finishes with an examination.

5. The advanced workshop

During the two days of the advanced training course we analyse the information in more depth. Therefore, it is necessary that the participants have previous knowledge of the basic course. The advanced course is useful for supervisors at maintenance offices and for the staff at drivers information offices, that is for people in responsible positions.

The workshop has two sessions:

- in the first participants learn how to use the RWiS in a more sophisticated manor
- in the second we simulate the work at a supervising office.

Initially we have a deeper discussion about how road stations at different sites react to changes in the weather. For example where does the slipperiness first occur when a cold period is followed by milder weather which starts with a passing warm front with snow fall? After analysing some important weather changes we have some exercises where we simulate the work at a supervising maintenance office. For this exercise we use authentic information like real road station data with corresponding radar and satellite images from the same period.

We also use the weather forecasts which were sent out to the road authorities. Subsequently, we show the information stored in the PC in a time sequence and the participants have to analyse the weather situation and suggest where to activate the maintenance crew and what to do. Through these excersises the maintenance people are will trained to analyse weather situations, find out the most interesting road stations and translate this into a plan of maintenance activities.

6. Summary

In Sweden, the National Road Administration has built up a very comprehensive system to monitor the weather and plan winter road maintenance work. The system is also used to support those who provide information to drivers.

Good training is needed to use the system efficiently. By knowing what will happen on the road surface in different weather situations you can do "the right thing at the right time". When preventive activities have to be undertaken, good warnings are supplied by the system, thereby saving both money and the environment. With less accidents, the cost to society is also reduced and consequently a lot of human suffering is avoided. Finally, the better trained the users of the RWiS are, the higher is the quality of winter road maintenance achieved.

These training courses are arranged by a special section of SNRA called VUC, the training centre of the road sector.