Use a route based forecast for dynamic gritting


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Winter clients
Airports
MRD

= Meteorological Research and Development

http://research.meteogroup.com

25 people
Products (examples)

- MOS and downscaling
- Energy forecasts: wind and solar power
- Run WRF
- Road forecasts
- Leaf fall model
- Consultancies
**Road model**

**Input elements:**
- Air temperature (MOS)
- Cloudiness
- Dewpoint (MOS)
- Precipitation
- Windspeed
- Soil temperature
- Road type (bridge?)

**Energy balance method**

**Combined physical and statistical model**

**Road surface temperature and condition**
Route based forecasting

Route based forecast instead of point forecast

-2 oC
0 oC
2 oC
Infrared measurement
Gritting

RWIS often in coldest part.
Entire road section is treated in the same way.

Is this useful?

Reduction possible!

Route based forecast
What do we need?

- Information about incoming and outgoing radiation
  - Skyview measurements
  - Solar view
- Meteorological information
  - Detailed weather forecast
  - RWIS site
  - (Air temperature / humidity measurement)
- Environmental information
  - (Thermal map)
Route based forecast

High resolution weather forecast on a grid

Model for calculating road surface temperatures

Route based forecast

Thermal map, TT/RH measurement

Database with for all routes:
- sky
- solar view factor
Examples network forecast

- Steel bridge below zero
- Open spots in country areas below zero
- Warm spots in the forest
Examples network forecast

Warm city

Cold bridge
Examples network forecast

UK Yorkshire 16-05-2012
### Examples network forecast

Amsterdam and Arnhem, 20 Feb 2012

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<th>Naam</th>
<th>Type</th>
<th>Tijd</th>
<th>T°w &lt; 0 °C</th>
<th>Conditie</th>
<th>T°w &gt; 0 °C</th>
<th>Min. wegedektemperatuur en conditie</th>
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</table>

(*x = max. percentage v. route < 0 °C  
v = max. percentage v. route met gladheid)
Verification

17 February 2011, Ede – Otterlo - Arnhem

Observation

Network model
Verification

17 February 2011, Ede – Otterlo - Arnhem

Observation
Networkmodel
Communication to gritting machine

Road temperature and condition
Communication to gritting machine

For extra safety: measure actual road surface temperature to check forecast
Communication to gritting machine

Two ways to optimize gritting:

1. Dynamic gritting
2. Dynamic routes

Road temperature and condition
1: Dynamic gritting

Use a variable amount of salt

Example:

Critical: \[ 7 \text{ g/m}^2 \]
RST < 0\(^\circ\)C: \[ 3 \text{ g/m}^2 \]
0 < RST < 1\(^\circ\)C: \[ 3 \text{ g/m}^2 \]
Rest: \[ 0 \text{ g/m}^2 \]
2: Dynamic routes

Optimize routes to treat critical places first.
Efficiency

Types of slipperiness:
• Precipitation
• Black ice
• Condensation

➢ Last (snowy) winter in 20% of cases dynamic gritting could have been applied.
➢ Normal winter: > 50% of cases can be dynamic.
Thank you