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SUSTAINABLE WINTER SERVICE FOR ROAD USERS

Efficiency of runway de-icing chemical in practice

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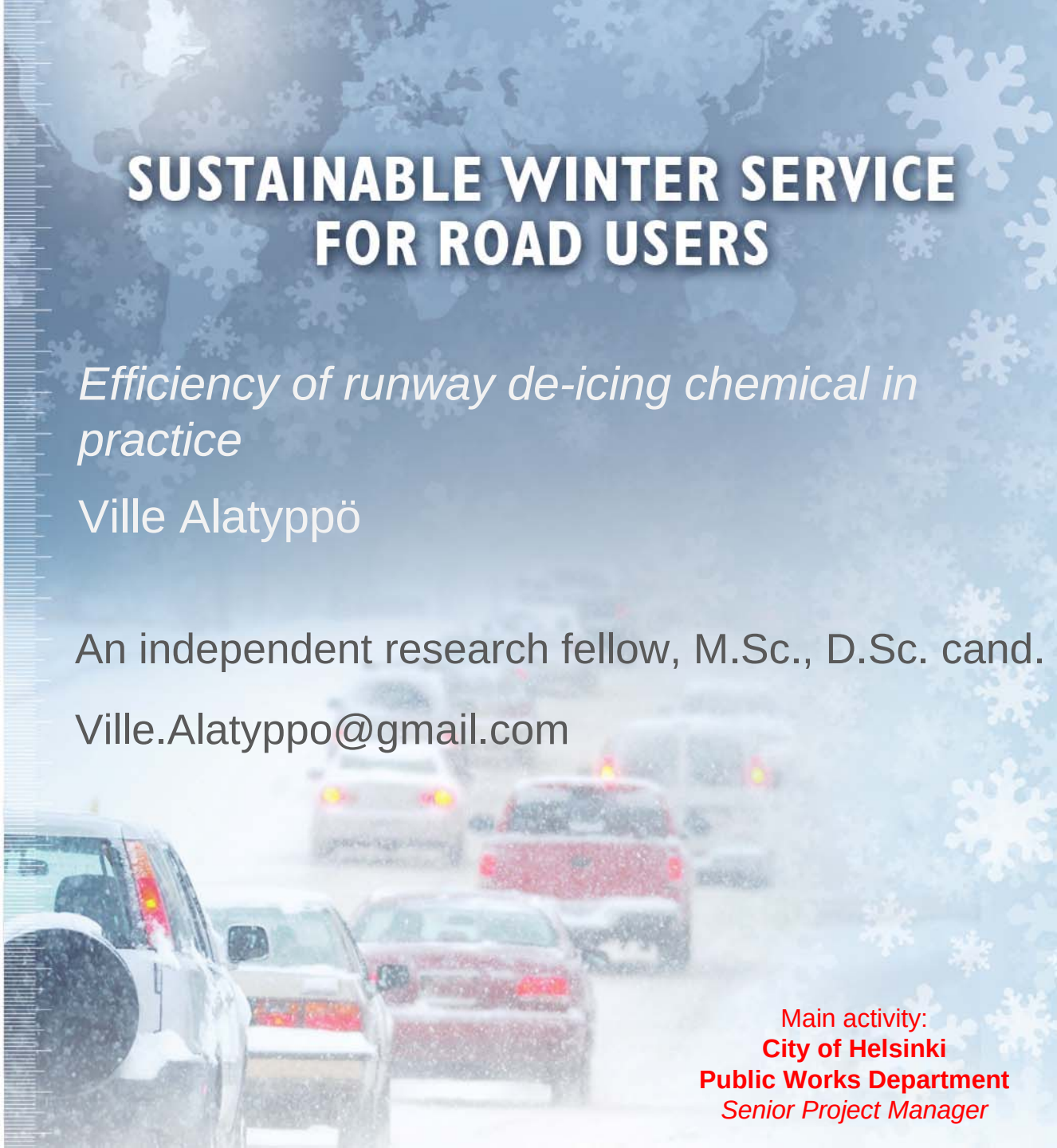


Main activity:
City of Helsinki
Public Works Department
Senior Project Manager

BACKGROUND

- Solid urea was used over a decade as a de-icing chemical at the airports.
- Due to the environmental impact of urea, acetates and formates were introduced. These chemicals are now used around 10 years.
- These chemicals have better temperature range than urea, but they are having another issues (heavy corrosion & pavements).

- In the year 2003, examination started if betaine (trimethylglysine) could perform as runway de-icing chemical.
- Betaine is manufactured by Finnfeeds Finland Ltd. subsidiary of Danisco A/S in Finland.
- This research work has been performed by mr. Alatyppö.

- Research work is not ended yet, even though it has been used for anti-skid treatments in three airports for four winter seasons in Finland.

BACKGROUND

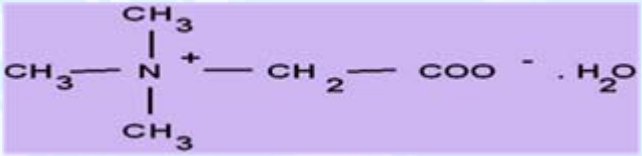
- Pure natural product
- Trimethylglysine, non-toxic

- Produced from the sugar beet molasses

- Exists all over in the nature, also in the human body
- Advantages:
- Not known to have any harmful environmental effects
- Bio-degradable (Used in also human and animal nutrition)
- Metal corrosivity remarkable low

- Produced by Finnfeeds Finland Danisco ltd. (www.danisco.com)
- Production and applications are protected with patents (EP 1034231)

- Products: Betafrost B (in liquid form, 50 w-%) & Betafrost S (solid)



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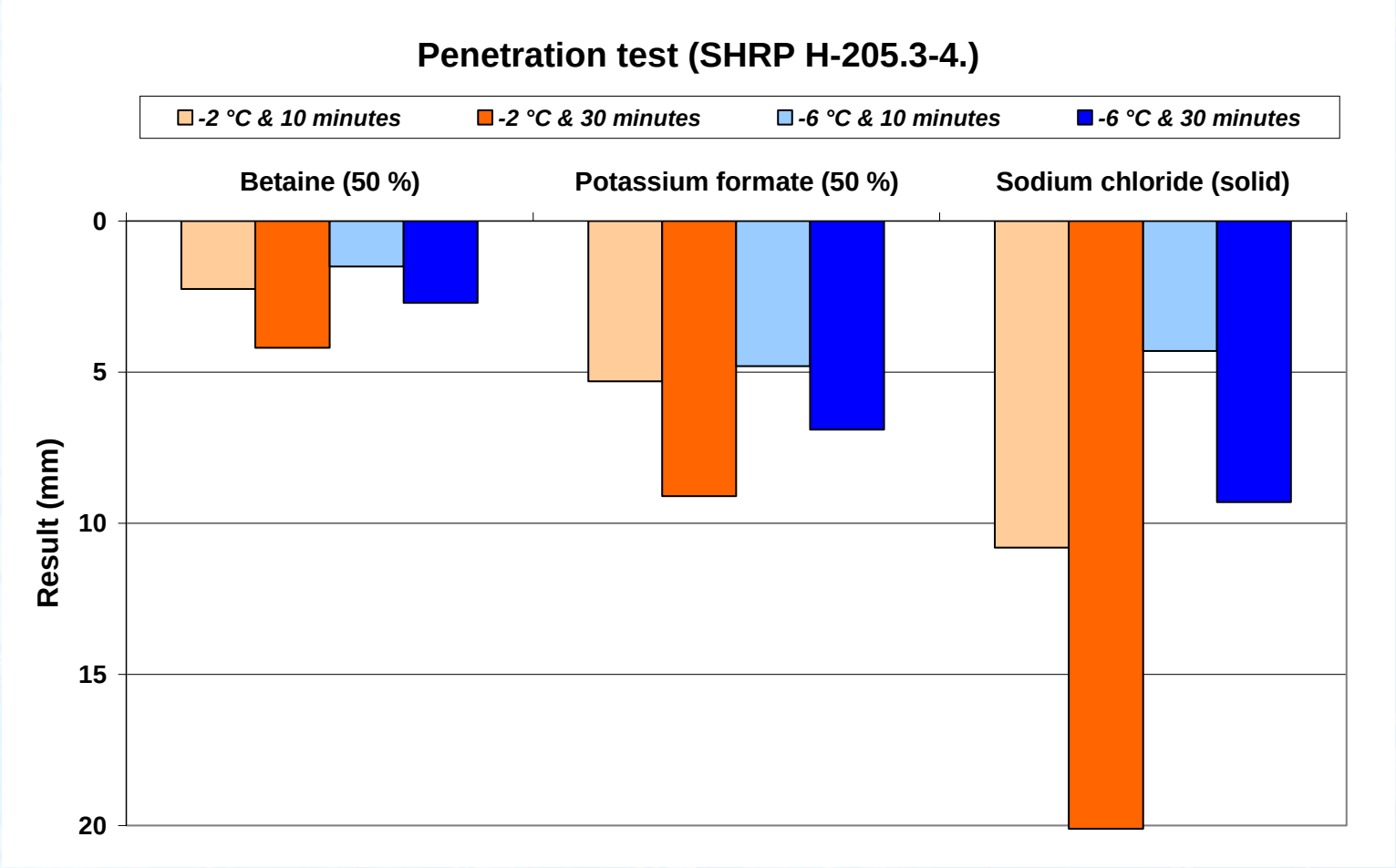
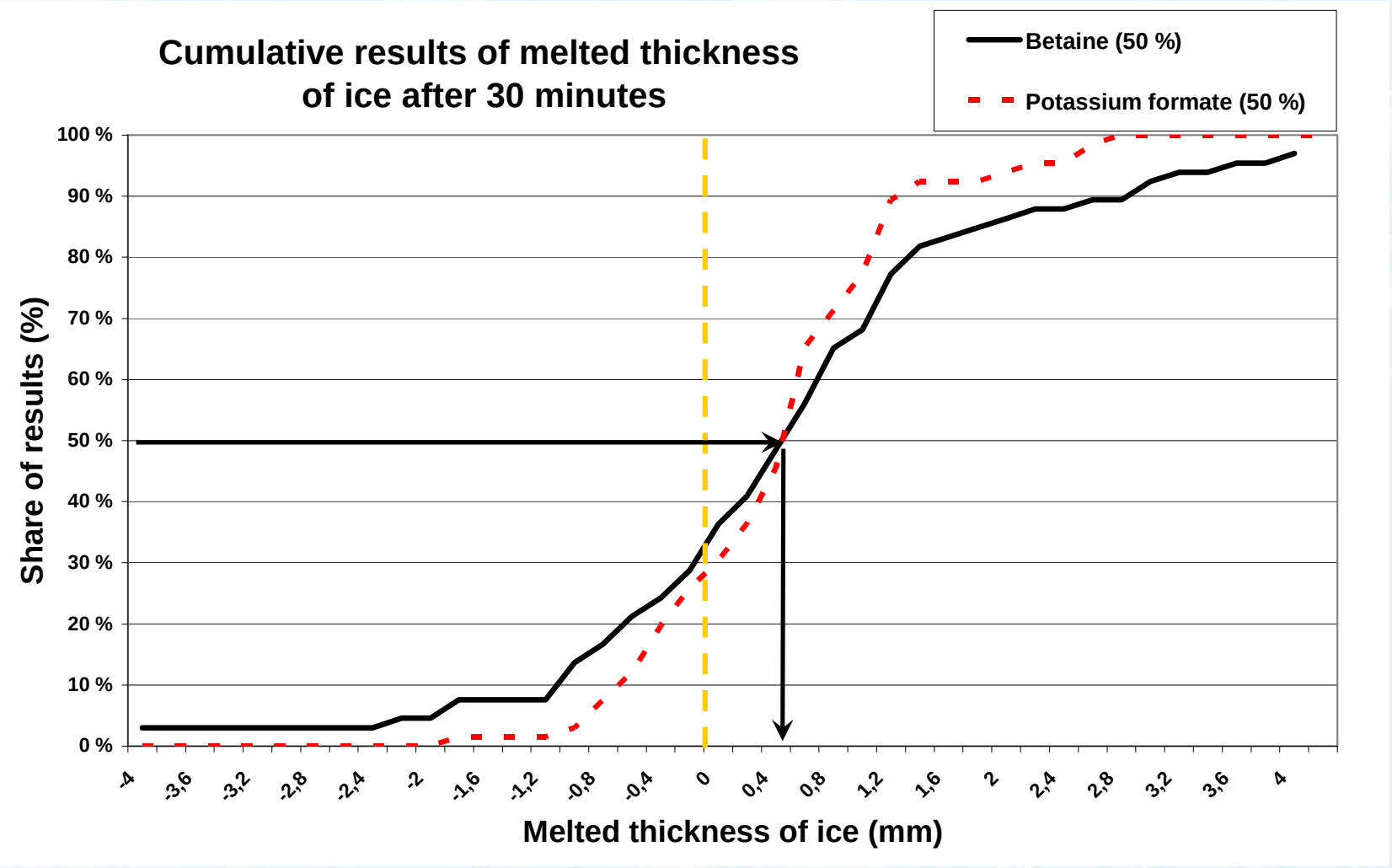
RESULTS FROM THE LABORATORY TESTS – LINK TO THE REALITY?



In the year 2003:
We were not disappointed, since betaine has other superior properties (very low corrosion effect)!

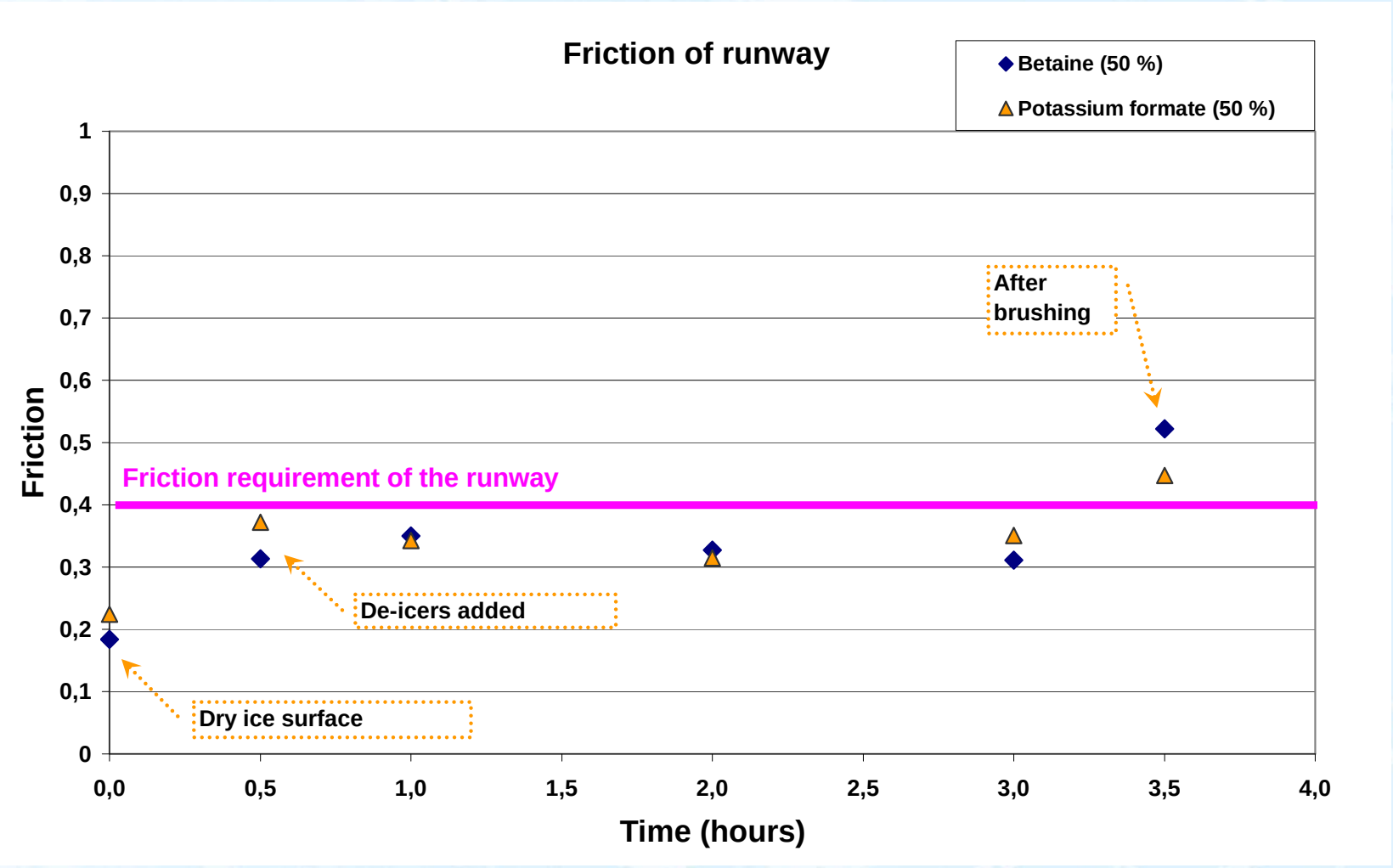
RESULTS FROM FIELD TEST – WHAT DO LABORATORY TESTS ILLUSTRATE?



From the year 2004: What kind of results are needed for real use on runway?

Very promising results, but additional information is needed (for safe use)! But what amount of information is enough?

FIELD TEST FOR FRICTION



Mechanical anti-skid treatment is essential, but where is the difference between chemicals seen on lab tests?

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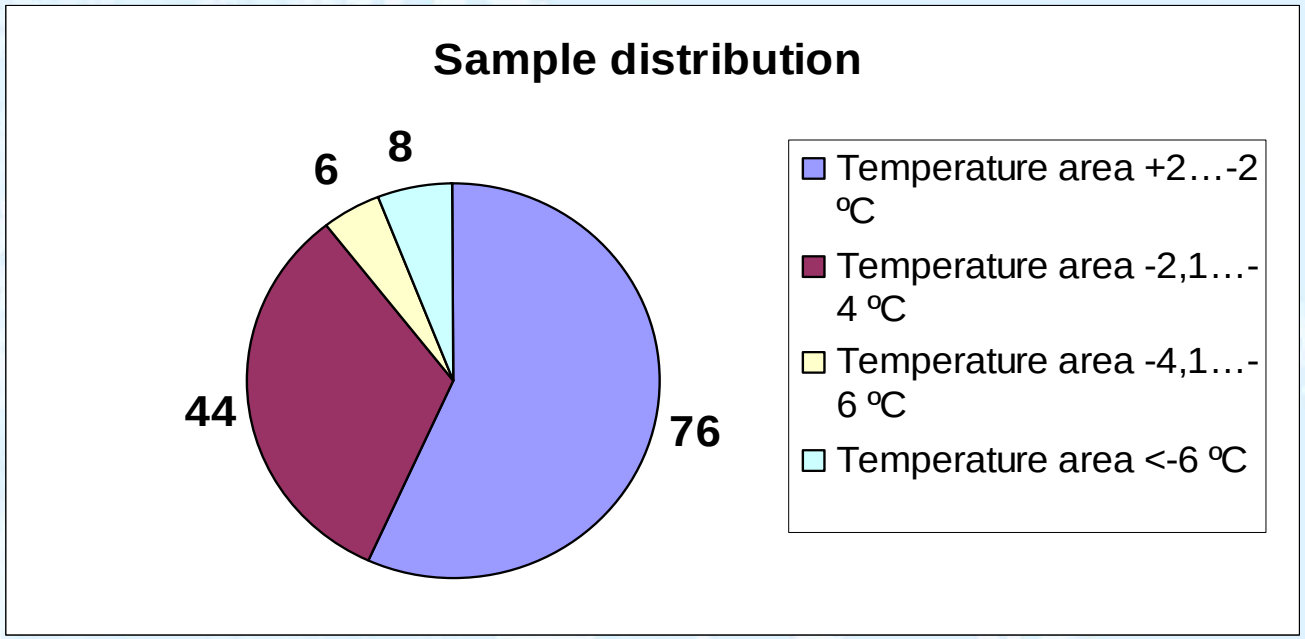
ANALYSE FROM THE REAL ANTI-SKID TREATMENTS

- Driving force to start the use of betaine was heavy corrosion issues in both military and civil aircrafts, these are due to the acetates and formates.
  - In Nordic countries, both Finnair & SAS have suffered from corrosion issues, are there others?
  - Especially Hawk-fleet corrodes easily.

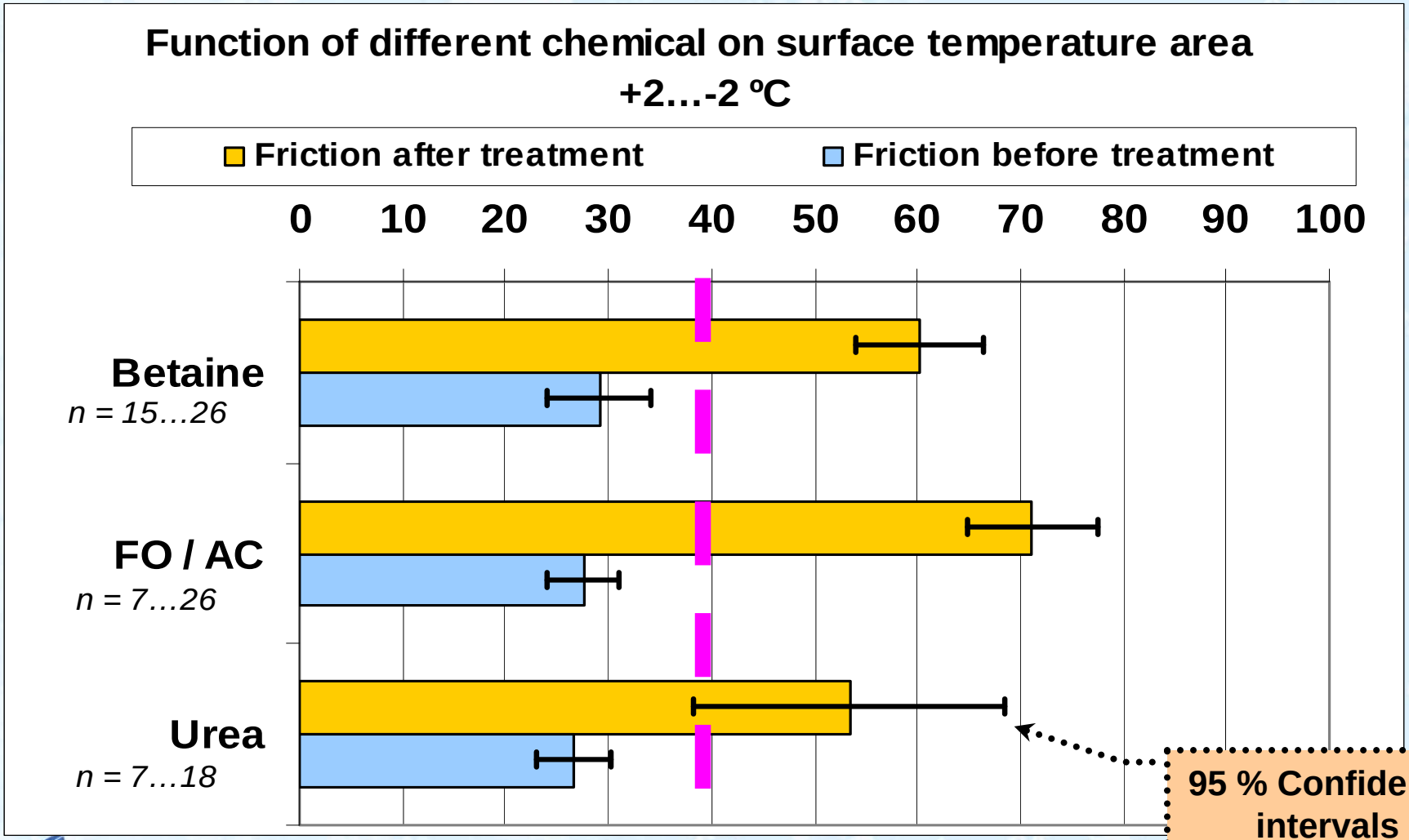
- Betaine was first used in two airports in Finland in the winter season 2005-2006.
  - Three airports have used betaine from the winter season 2007-2008 (5 winter seasons experience at the moment). Is it still in test use?
- Analyse of friction properties for different de-icing agents (betaine, formiate/acetate and urea) was made in 2007 (3 winter seasons data).

SAMPLE DISTRIBUTION

- Totally 134 anti-skid treatment cases
- Results divided into four temperature areas



RESULTS – ADEQUATE MELTING EFFECTIVENESS IN THE LABORATORY TEST?



CONCLUSIONS

- Laboraroty tests for ice melting effectiveness do not illustrate chemical effect in the reality.
  - **Field tests / test use should be performed every time.**

- From practical view, betaine is more effective agent than urea, but loses a bit to acetates or formiates.
  - Airports are still using betaine (no accidents) since it is having superior corrosion properties.
  - Low-corrosion benefits (and safety aspects) are greater than possible extra cost (product is still under development to give unique advantages for each user)
  - Valuable development work together with Finavia & Finnish Air Force
- Airports managed decades with urea; they could easily manage with betaine

  - What is important – safety in all matters (aircrafts & operations & environment) or better ice melting effectiveness?
  - How severe accidents due to corrosion damages are needed before good corrosion properties are no1 in the requirement list? (...SAS Dash aircrafts)
  - Users of de-icing chemicals (also aircraft carriers) have the last word…?
  - How good knowledge of different properties should they have?

PERFORMING FIELD TESTS IS NOT A JOB WHICH COULD BE DONE FROM THE OFFICE..

FOR MORE INFORMATION:

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Thank you for your attention!