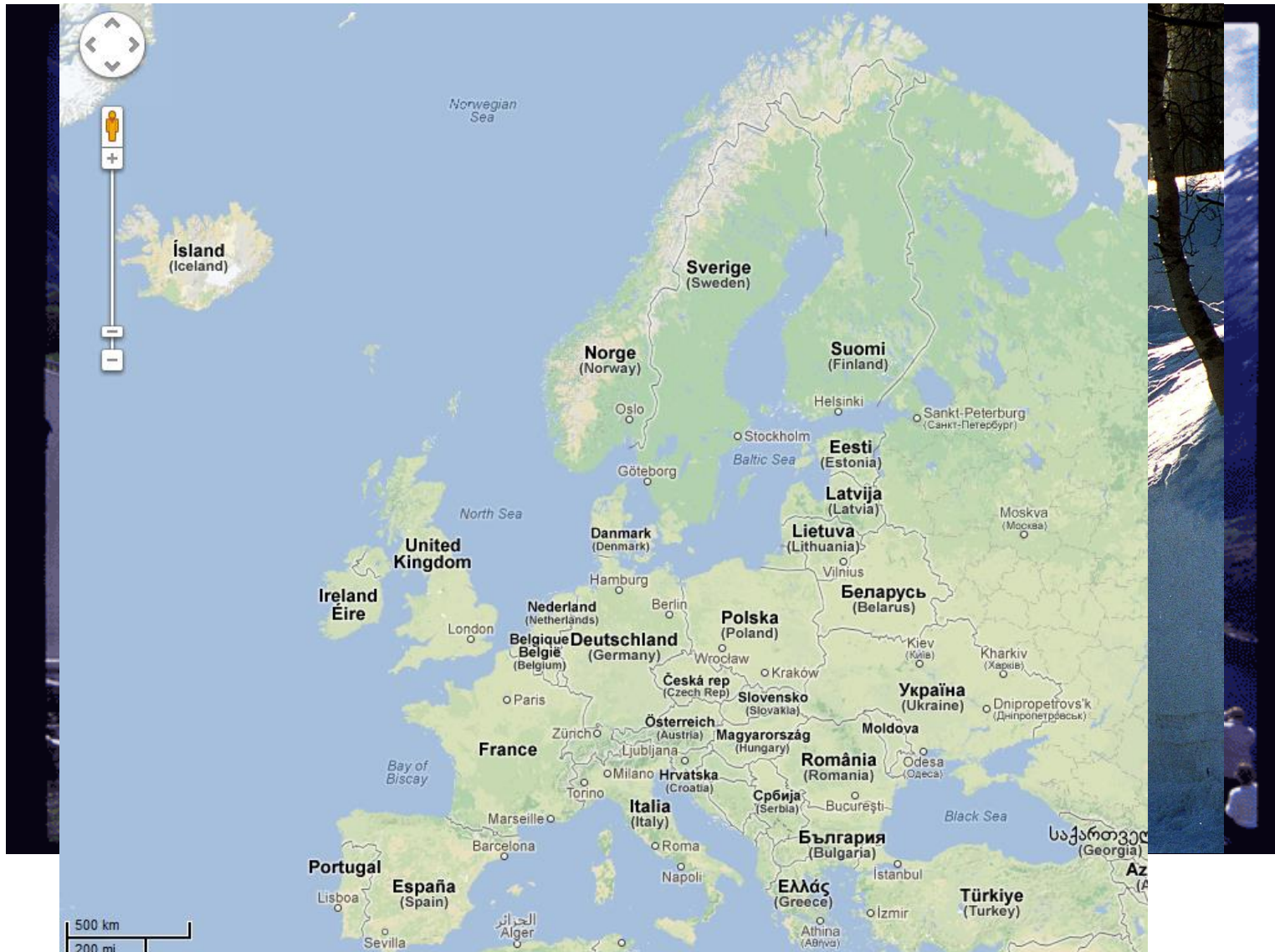




# Recent Advances in WMA Technology – Summary from Norway

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# Norway



# Agenda

- History – Development of the WAM Foam technology
- LTA 2011 – project
- Norway 2013

# WAM Foam by Shell Bitumen and Veidekke



# Development of the WAM process

- 1995 Project starts up with preliminary lab trials
- Emulsion-idea  
1996 Field trial – Hunndalen  
1997 Field trial – Lena
- Foam-idea  
1998 Laboratory testing  
1999 Field trials – Hobøl  
2000 Field trials – Hobøl  
2000 Demonstration RV 120: +/- 200 ton  
2000 "The WAM Foam" presented at the Eurobitume/Euroasphalt conference.
- 2001 – 2003 About 50 000 ton produced

# Experiences from WAM Foam

- Reduced fuel consumption.
- 30 % reduction in CO<sub>2</sub>-emissions.
- Improved environmental conditions for personnel and surroundings.
- Fume from WAM Foam is below detection limits,  
**Health & Safety!**
- Reduced temperature => **reduced oxidation/ageing of binder**
- WAM Foam satisfies all Hot Mix Asphalt specifications according to Handbook 018 (Norwegian Standard)
- Production capacity maintained

## Norwegian WMA project – Low Temperature Asphalt 2011 Main report



# Chemical Working Environment – Measurement of Asphalt Fumes



LTA  
2011



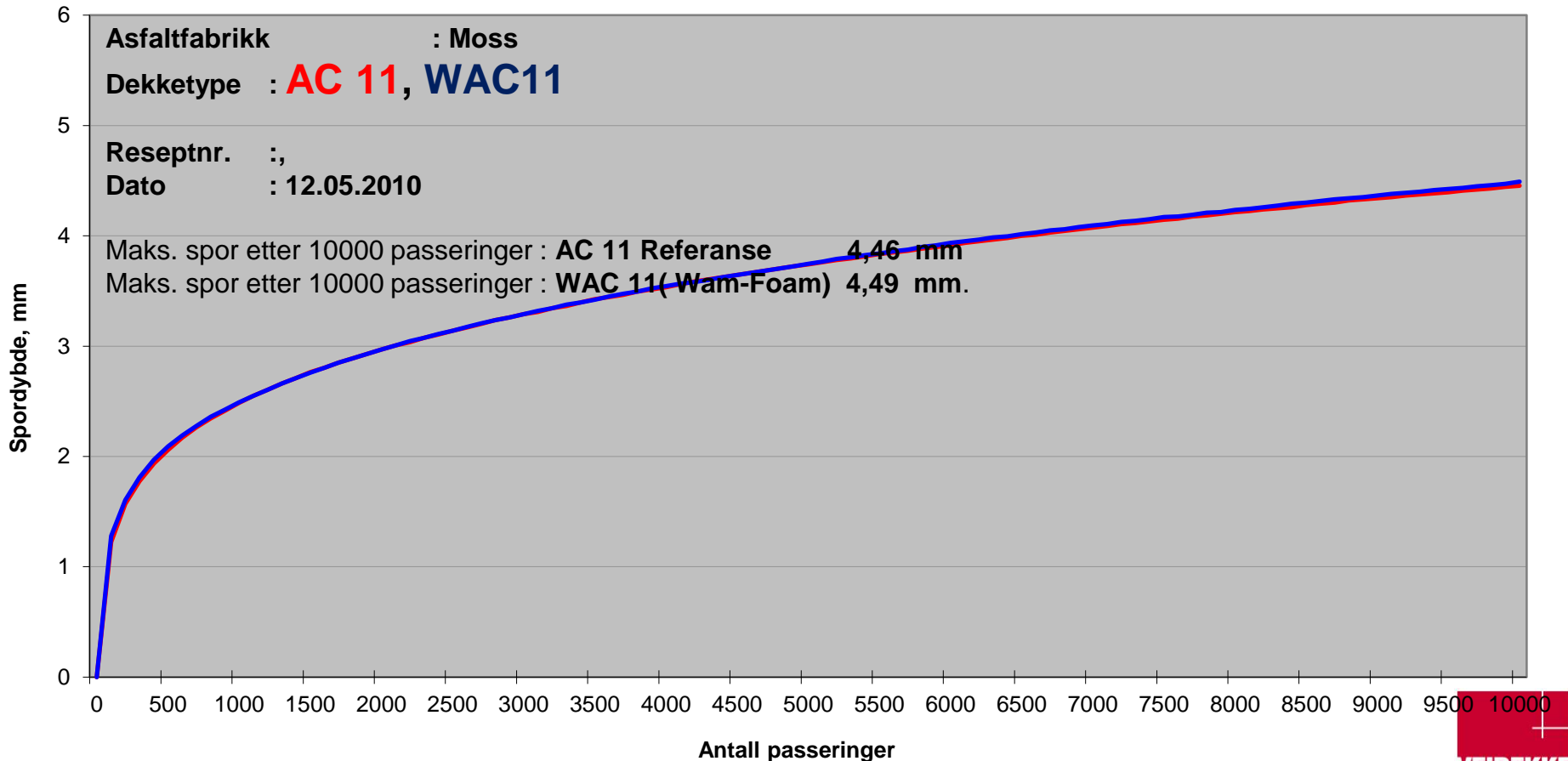
# Manuel asphalt work – workability/ergonomy



# Quality Control of Asphalt Pavement



# Wheel Track Test - AC11 vs. WAC11



# CONCLUSIONS «LTA 2011»

- Chemical Working Environment: The amount of asphalt fumes shows a significant reduction at a temperature reduction by 30°C
- Physical Working Condition: Visual observation and feedback from workers shows differences in workability between different low temperature techniques. Foaming techniques shows workability similar to hot mix at a temperature reduction by 30°C
- Asphalt quality:  
Conclusion, after paving and control, is that low temperature asphalt (30°C reduction) has the same quality and the same expected life time as hot mix asphalt.

The asphalt pavements will be followed up to measure development and real lifetime.

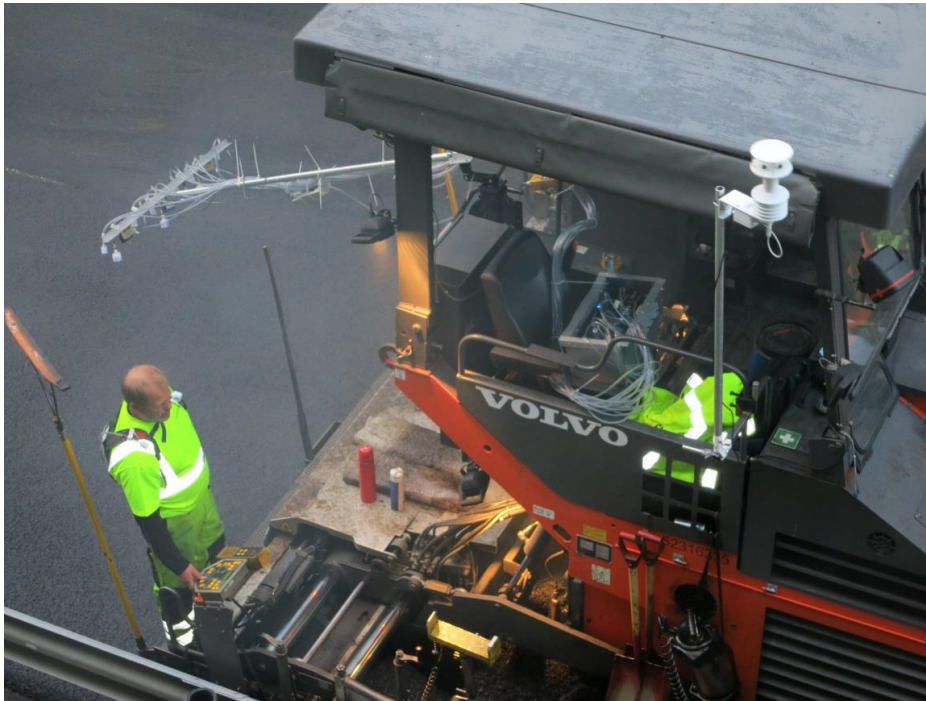
# Norway 2013

- The Road Authorities want to accelerate the use of WMA.
- To achieve this it is in 2013 a bonus payment, about \$ 5, per ton asphalt, when produced by at least 25 degrees Celsius lower temperature than conventional production.
- It is assumed used foam techniques.

# Norway 2013

- 3 asphalt producers have produced 210.000 tons of WMA (September)
- 16 asphalt plants (both batch and drum mix) have produced WMA
- In general positive results on the road
- Some technical challenges on plants due to lower production temperature

# WMA with PMB, July 2013



- No technical problem paving foam-mixes with PMB at 140°C
- Reference HMA: 180°C
- Compaction is equal
- Water susceptibility is equal when testing mixes from production
- 93 % reduction in bitumen fume (Dust Trak)

# Workability test on WMA, September 2013



- No problem paving foam-mix WMA by hand.
- Asphalt at (too) high temperature is handled by hand more easily than WMA.

Test with long storage in silo and test with boat transport. Promising, but results not finished.





Thank you for your attention

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