


Rolling Density Meter Implementation

Presenter: Eyoab Zegeye Teshale

SHRP2 R06C GPR Rolling Density Meter Peer Exchange
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Rolling Density Meter (RDM)

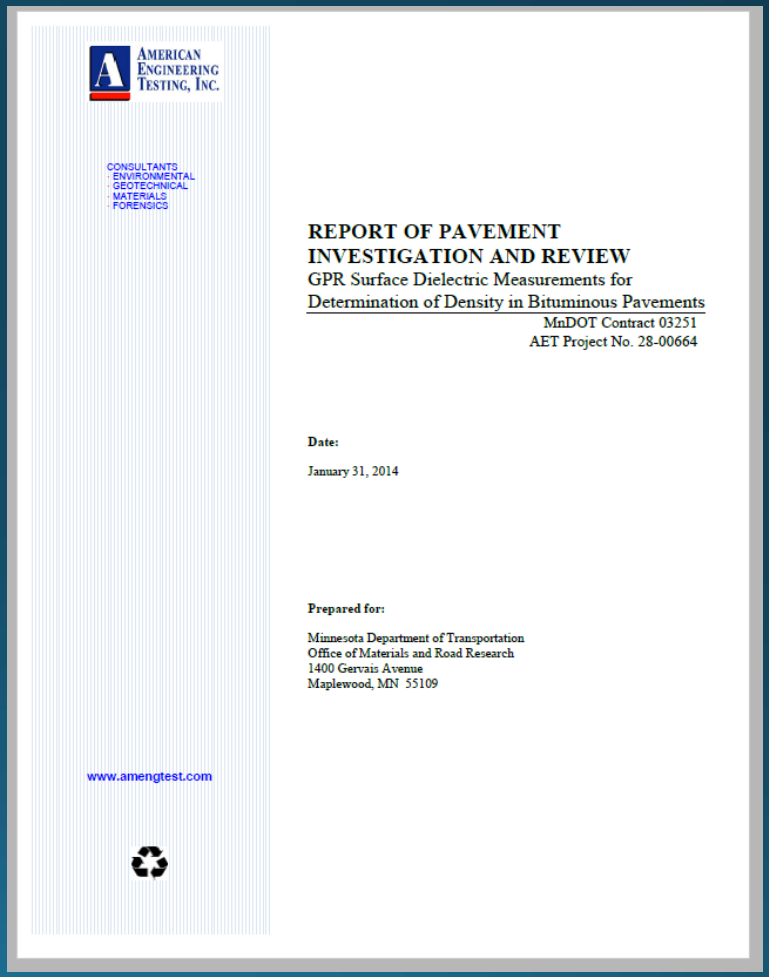
Collaboration with MNDOT

- Equipment and procedures (set up, calibration, testing & survey patterns)
- Application of RDM for HMA compaction assessments
- Development of a vehicle–mounted RDM frame setup
- Data collection, organization and processing
- Selection of coring locations

Rolling Density Meter (RDM)

Background

- Forensic evaluation of pavement using NDT (GPR, FWD, IRI etc.,)
- Inspection and monitoring of quality and process of pavement products
- Assessment of pavement compaction using Intelligent Compaction (i.e. IC, PMTP)
- 2014: MnDOT pavement investigation on using GPR (air-coupled) to measure density



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REPORT OF PAVEMENT INVESTIGATION AND REVIEW
GPR Surface Dielectric Measurements for
Determination of Density in Bituminous Pavements
MnDOT Contract 03251
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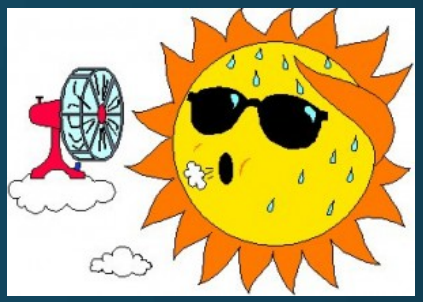
Rolling Density Meter (RDM)



Vehicle-Mounted RDM setup

- Maximize productivity of testing
- Improve safety & comfort for operators
- Reduce intrusion to traffic & construction operations
- Continuous power supply (Toughbook, GPS, camera etc.,)

How

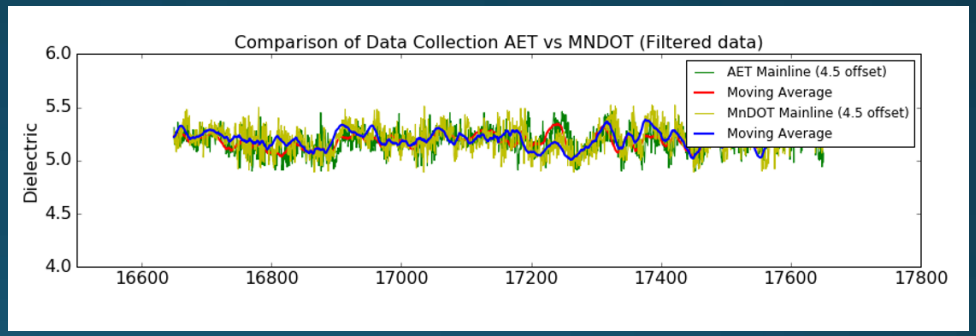
- Build on the RDM Know-How gathered by MnDOT
- Adapt AET techniques used for GPR, IRI, FWD testing
- Assess cart-mounted versus vehicle-mounted systems

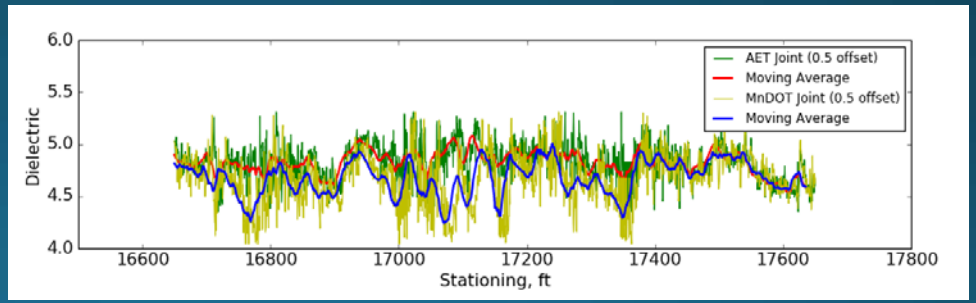
Rolling Density Meter (RDM)

Cart vs. Vehicle system

- Very limited data
- Need to control wandering around joints

Center of lane





Adjacent to joint

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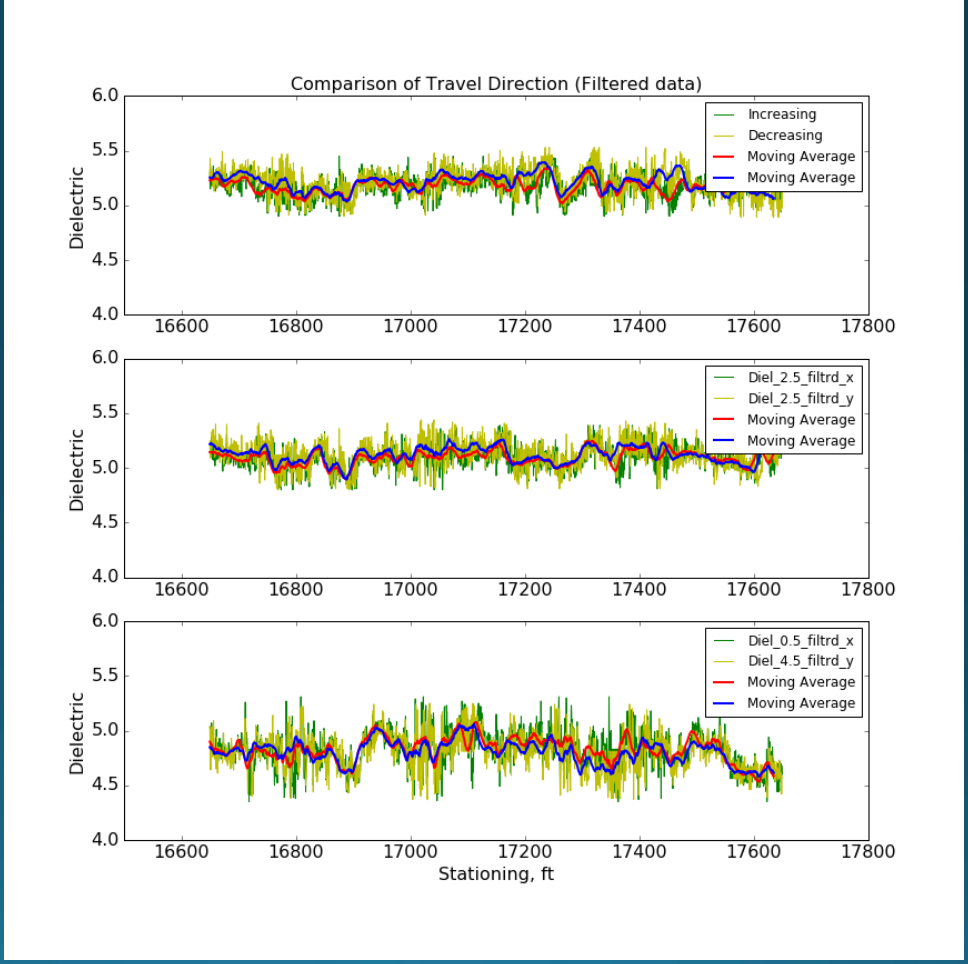
Cart vs. Vehicle system

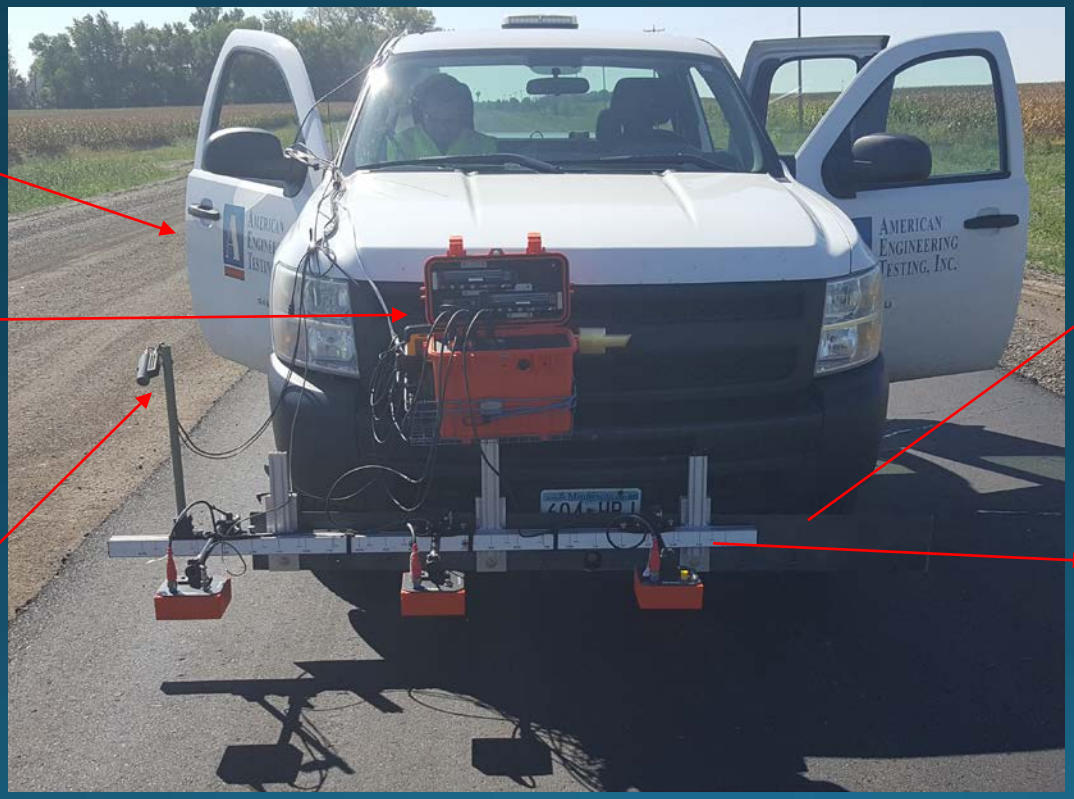
- Effect of collection direction was found negligible



Rolling Density Meter (RDM)

Vehicle-Mounted RDM

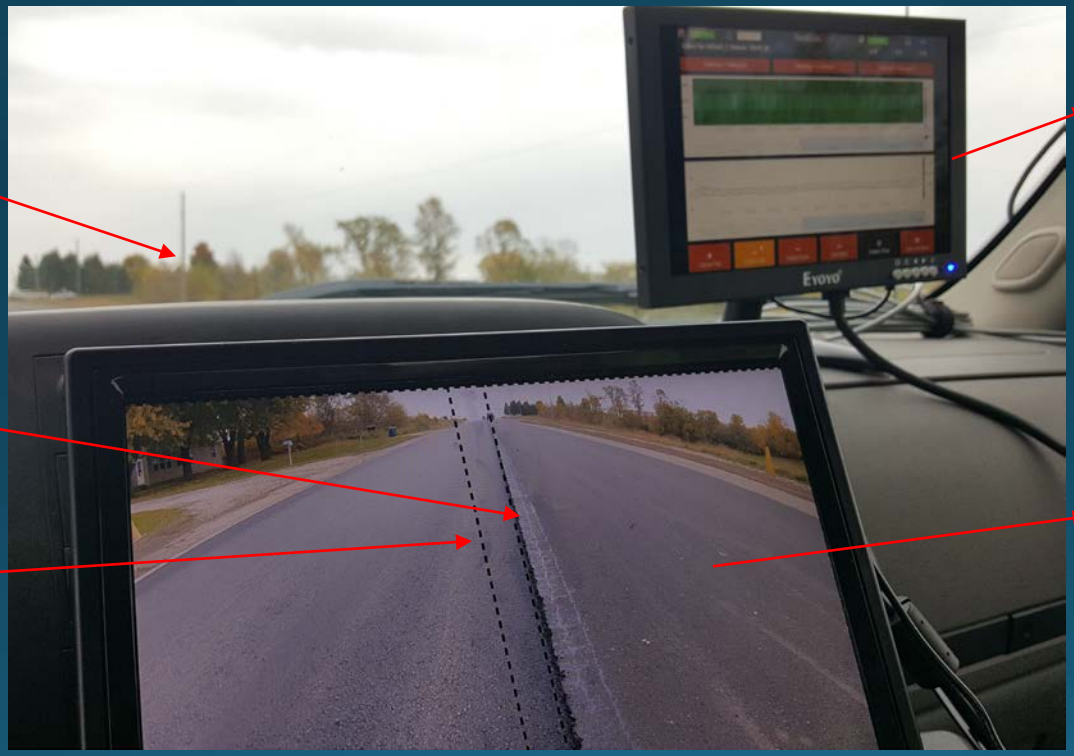
- Mounting apparatus (outside)



Rolling Density Meter (RDM)

Vehicle-Mounted RDM

- Control system (inside)



Rolling Density Meter (RDM)

Data collection – HMA pavement compactions

- CSAH 13 - Washington County, MN (0.5 miles)
  - Cart vs. Vehicle mounted RDM systems
  - Effect of collection direction
- TH 110 - Ramsey County, MN (2.5 miles)
  - Joint pass survey (unconfined joints)
- TH 60 - Rice and Goodhew County, MN (8 miles)
  - Joint pass survey (unconfined joints)
- TH 22 - Blue Earth County, MN (30 miles)
  - Joint pass and center of lane surveys
  - Immediately after compaction and next day survey
  - Survey of confined and unconfined joints
  - Three lifts
  - Full coverage

Rolling Density Meter (RDM)

Consultant perspective: Factors impacting costs and coverage density

- Traffic control type
  - Moving single lane closure (TH60)
  - Road closed for project (TH22)
  - Post-construction (Rolling attenuator)
- Paving strategies
  - One lane at a time (TH22)
  - Daily switch of lane to balance (TH60)
- Project details
  - Location
  - Length and lift numbers
  - Weather

Rolling Density Meter (RDM)

Consultant perspective: Equipment and challenges

- Battery-powered device (5-6 hours)
- Limited feedback
  - Surface dielectric
  - Can RDM output travel times to measure thickness ?
- Calibration for vehicle mounted RDM
  - “Jump calibration” ?
- Subjective measurements
  - How do you verify the joint data was measured within the specified offset ?
  - Antenna height readjusted after calibration
  - Vehicle weight adjusted

Rolling Density Meter (RDM)

Consultant perspective: Other potential applications

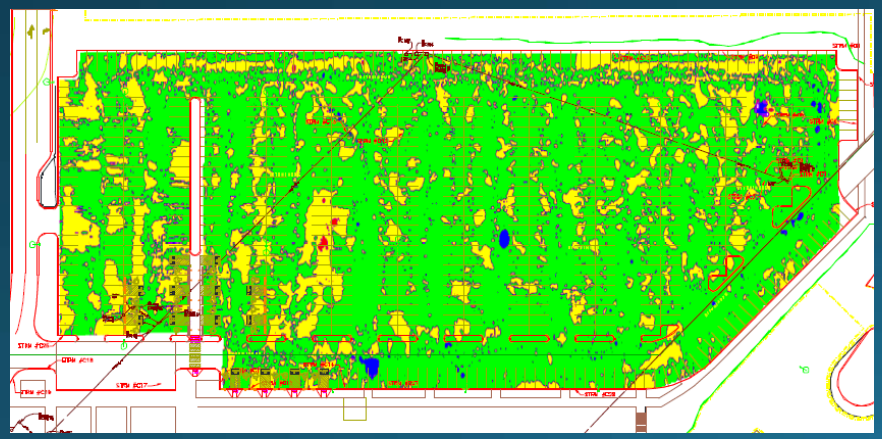
- Considerations for investing on RDM
  - Specification and standards
  - Is this a final product of RDM ?
  - Other potential applications (i.e. parking lots)
  - Relationships to other intelligent compaction measurements (IC, PMTP)

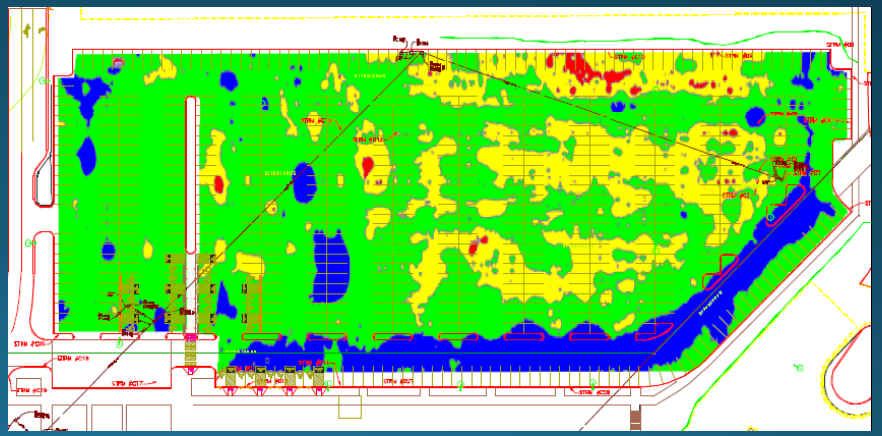
Rolling Density Meter (RDM)

Consultant perspective: Other potential applications

Surface uniformity: RDM surface dielectric

Layer thickness: Air-coupled GPR antenna





Acknowledgements

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Thank you !!!

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