



Research Pays Off Series

Safer, Smarter, Sustainable Pavements through Innovative Research



**Chip Seal – Use and Benefit to Minnesota
Asphalt Research Group (A Team)**

We all have a stake in **A  B**



Agenda

- History
- What was done
- Results
- Benefits of doing it correctly
- Accolades
- Where are we going next



History

- 1990's Chip Sealing Was Dying
- Great variability in performance
- No guarantee of success
- Locals believed in value of chip seal at PMT



What was done

- LRRB fund position to study chip sealing
- Worked on developing design method
- Wrote the Seal Coat Handbook
- Worked on implementation
 - Training
 - Support
 - On going research



What was done

- Updated specifications
 - Changed pay items
 - Gallons / Square Yard
 - Improve materials
 - CRS-2p
 - Flakiness Index
 - Gradation



What was done

- Made Contractor responsible for vehicle damage
- Developed and implemented fog sealing of chip seal
- Developed methods for dealing with pavement markings



Dealing with Pavement Markings

- Removal by grinding
 - \$1.00 + linear foot
- Pre treatment them with emulsion
 - \$0.05 linear foot



Results

- Less vehicle damage
- Less flushing
- Almost no snow plow damage
- Increased life of chip seal
 - From 5 to 7 years
 - 10 to 15 years
- Cost has not increased above inflation rate





Chip sealing higher ADT roadways

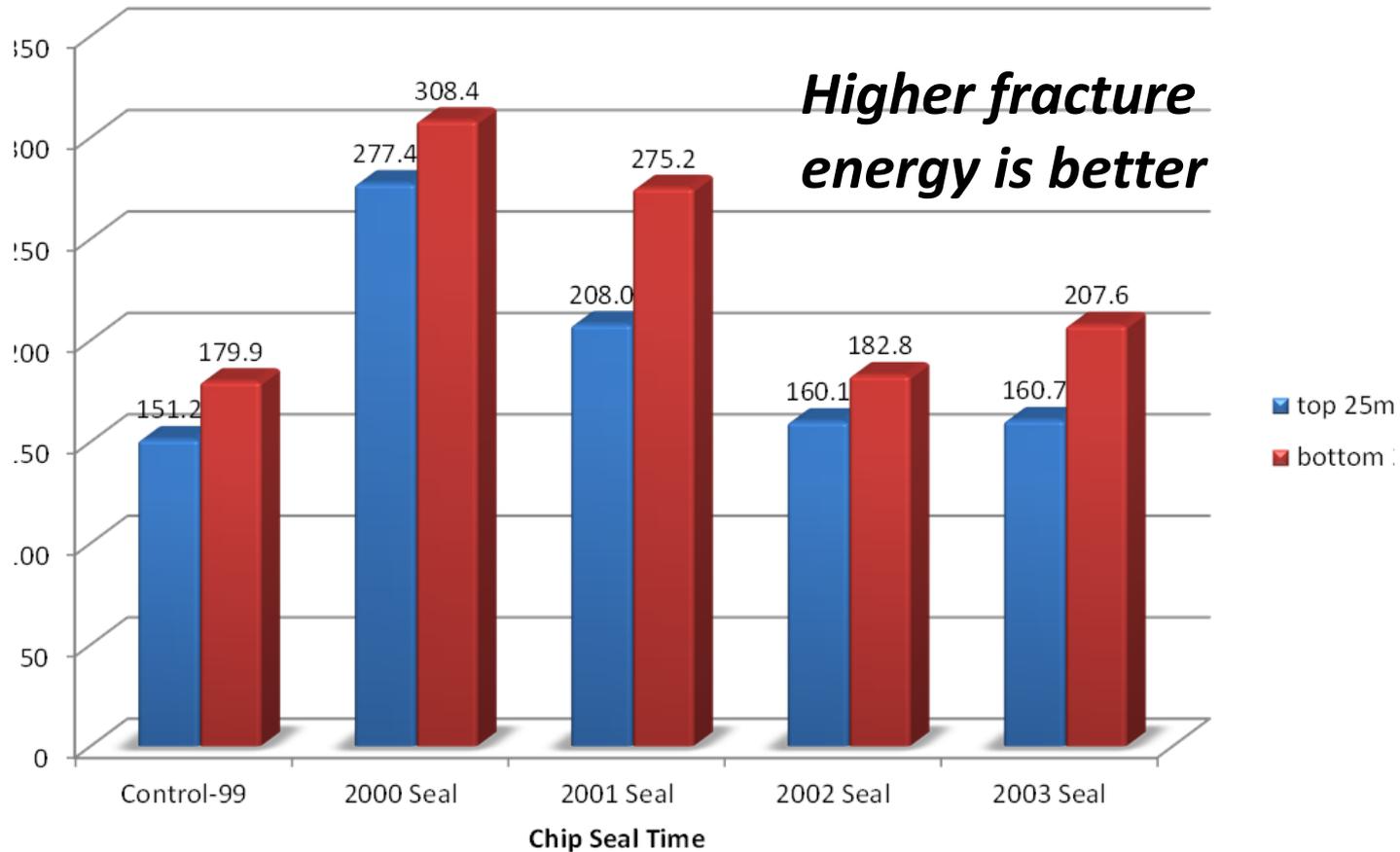


Benefits of doing it correctly



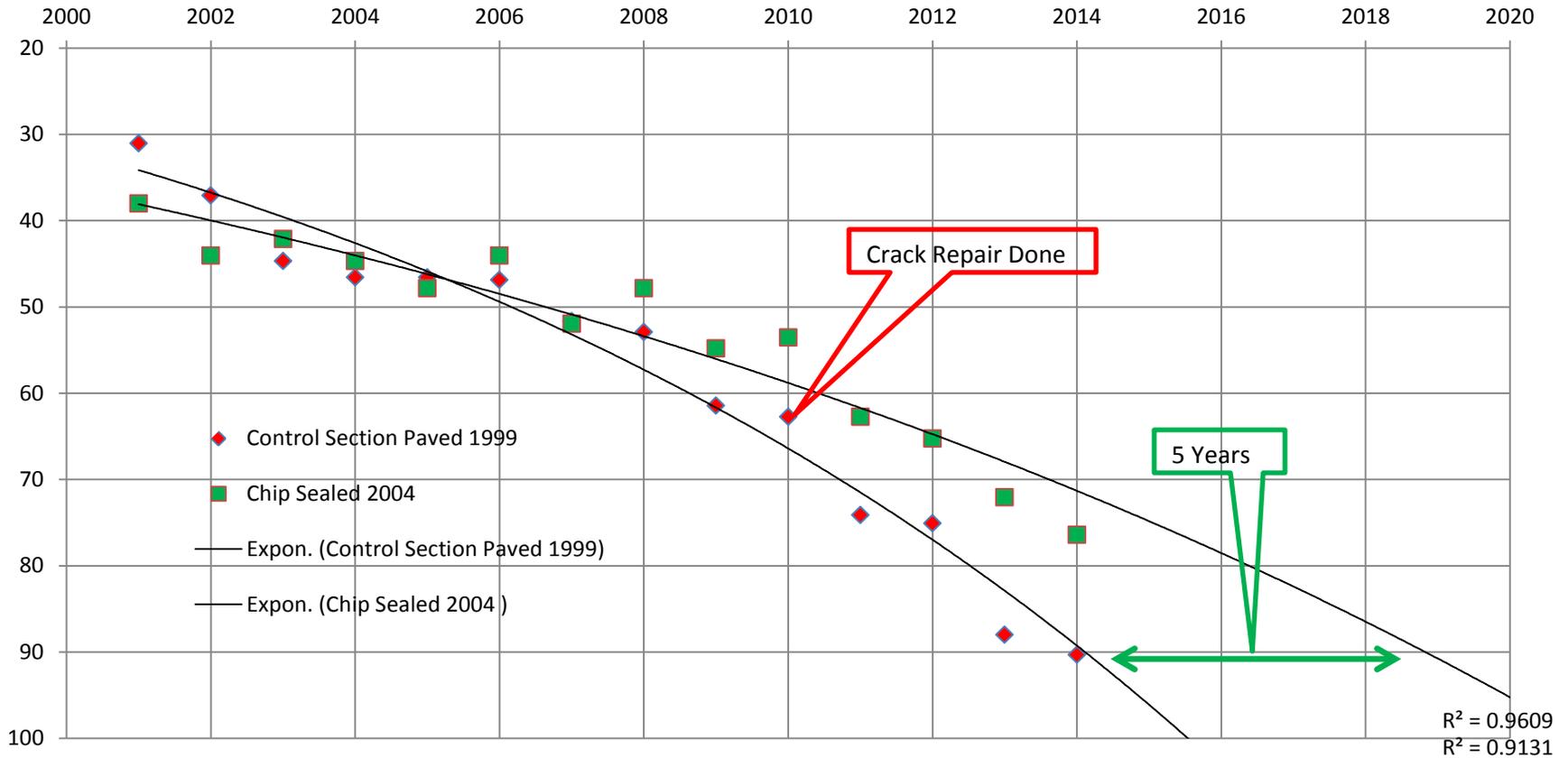
DC(T) Results: TH-56

TH56: DC(t) Data @ -24°C



Ride Data

TH 56 IRI Average





Crack Repair



Control Section Never Chip Sealed



Last Section Chip Sealed 2004



Accolades

- Article in FP² Pavement Preservation Journal
 - *“Penetrating Emulsion, Double Chip Seal Saves Unpaved Road”*
- TRB Journal
 - *“Research Pays Off, Effective Use of Chip Seals in Minnesota”*



Accolades

- New AASHTO Specification on Chip Sealing is modeled after MnDOT's Specifications
- Other State and FHWA reference MnDOT Seal Coat Handbook and Specifications
- Requests from all over USA to talk about Chip Seals



Where Are We Going Next



Where Are We Going Next

- Using micro milling to improve ride before chip sealing
- Using chip seals to reduce cracking in HMA overlays
 - Texas under seal (Bituminous under seal treatment)
- Developing chip seals at method to lightly surface low volume roadways, and shoulders



Where Are We Going Next

- Studying new methods, material, and equipment
- Continuing education and training
- Starting another long term aging study in partnership with State Aid Office



Where Are We Going Next

- Working with NCAT and member states for North region PM study
- Working on faster curing asphalt emulsions for fog sealing



Developing Faster Setting Emulsion CFS-1h



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What is it

- Same base asphalt as CSS-1h
- Uses Rapid Set emulsifiers
- Designation CFS – 1H
 - Minimum 30% residual asphalt
 - Not diluted in field
 - Pen range 40 to 90 pen
 - Sieve 0.1% max
- Cost similar to diluted CSS-1h



Value of Fog Sealing



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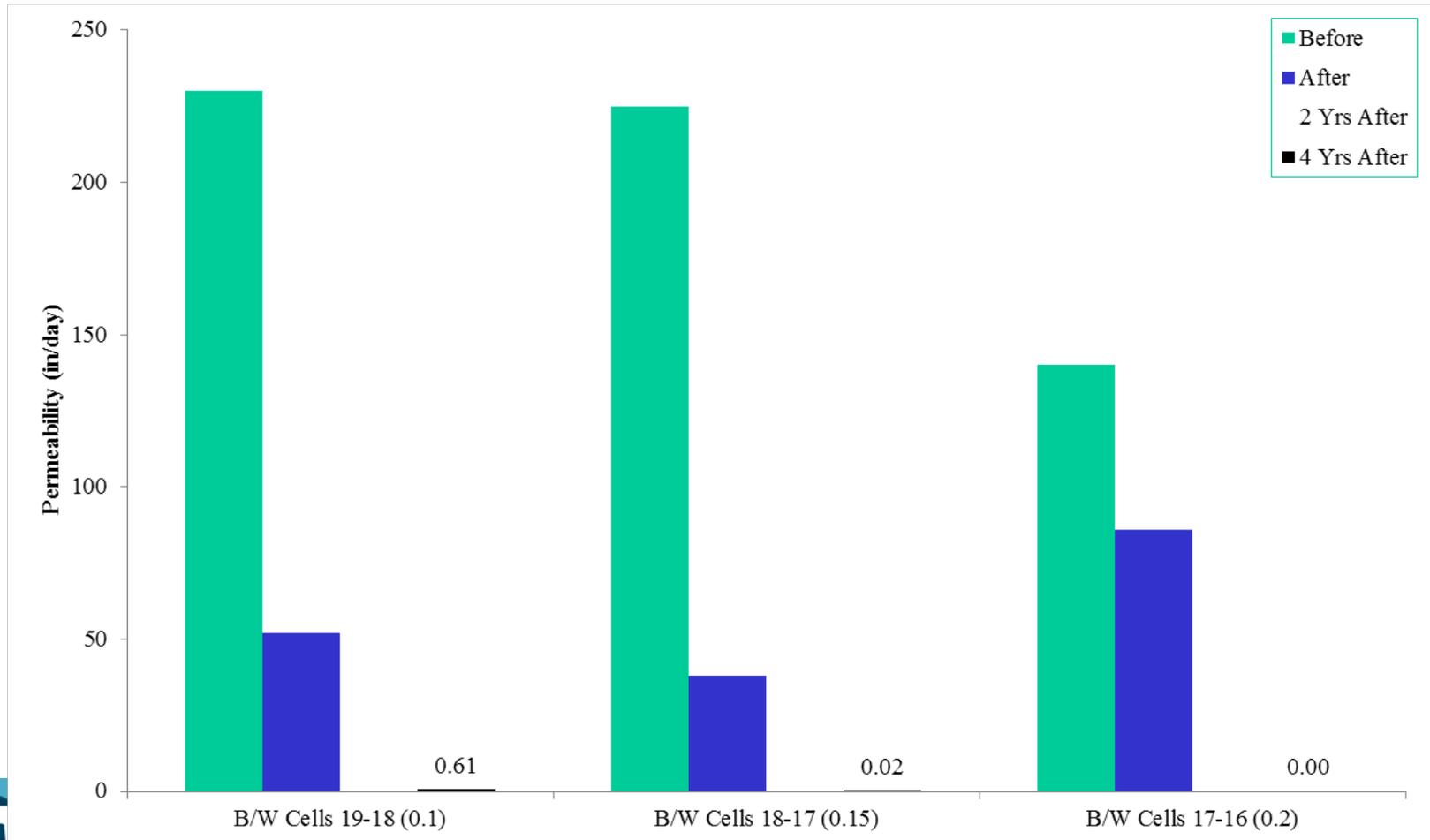
Why Fog Sealing Shoulders (Picture taken in 2009)



Fog Seal
applied 2001



Fog Sealing still working after 4 years



Thank You

