# IDOT Technical Update / Innovations

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IAPA 84TH ANNUAL CONFERENCE

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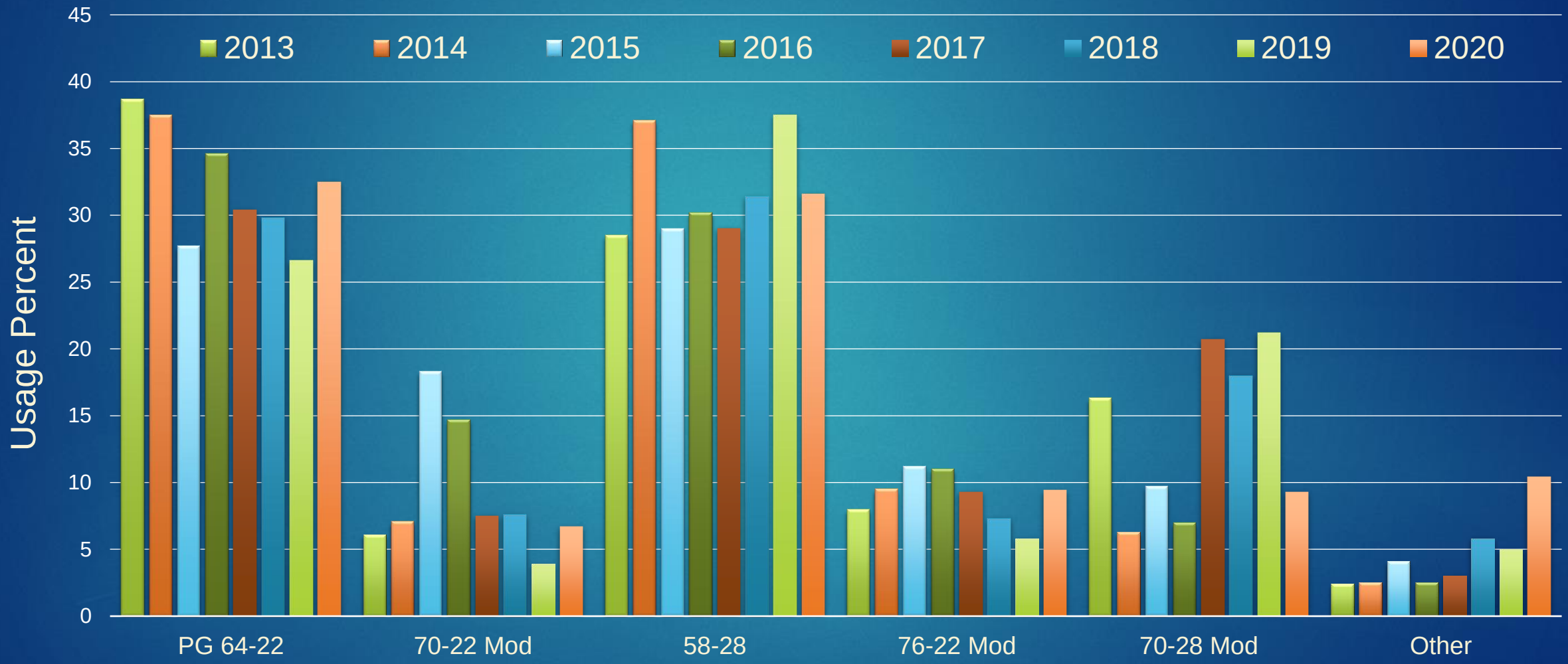
# Overview

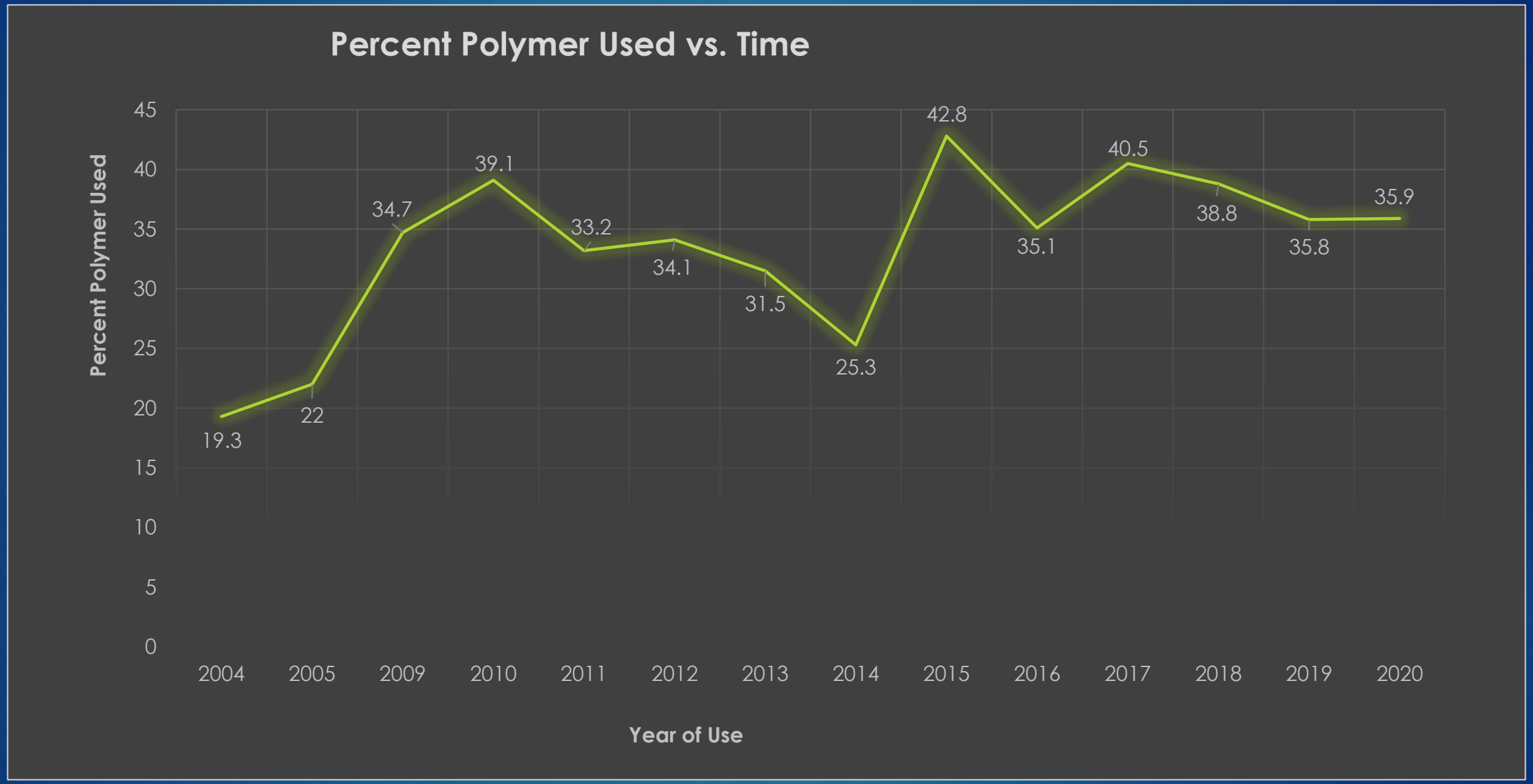
- HMA Quantities
- Binder Usage and Price Index
- Binder Modifiers, Research / Protocol
- Binder Grade Changes on Hold
- I-FIT Implementation
- 2022 Spec Book – HMA Changes
- FLS Overlays and Deck Waterproofing
- Wax-Modified Tack
- QMTP - Lake Land College
- CMMS

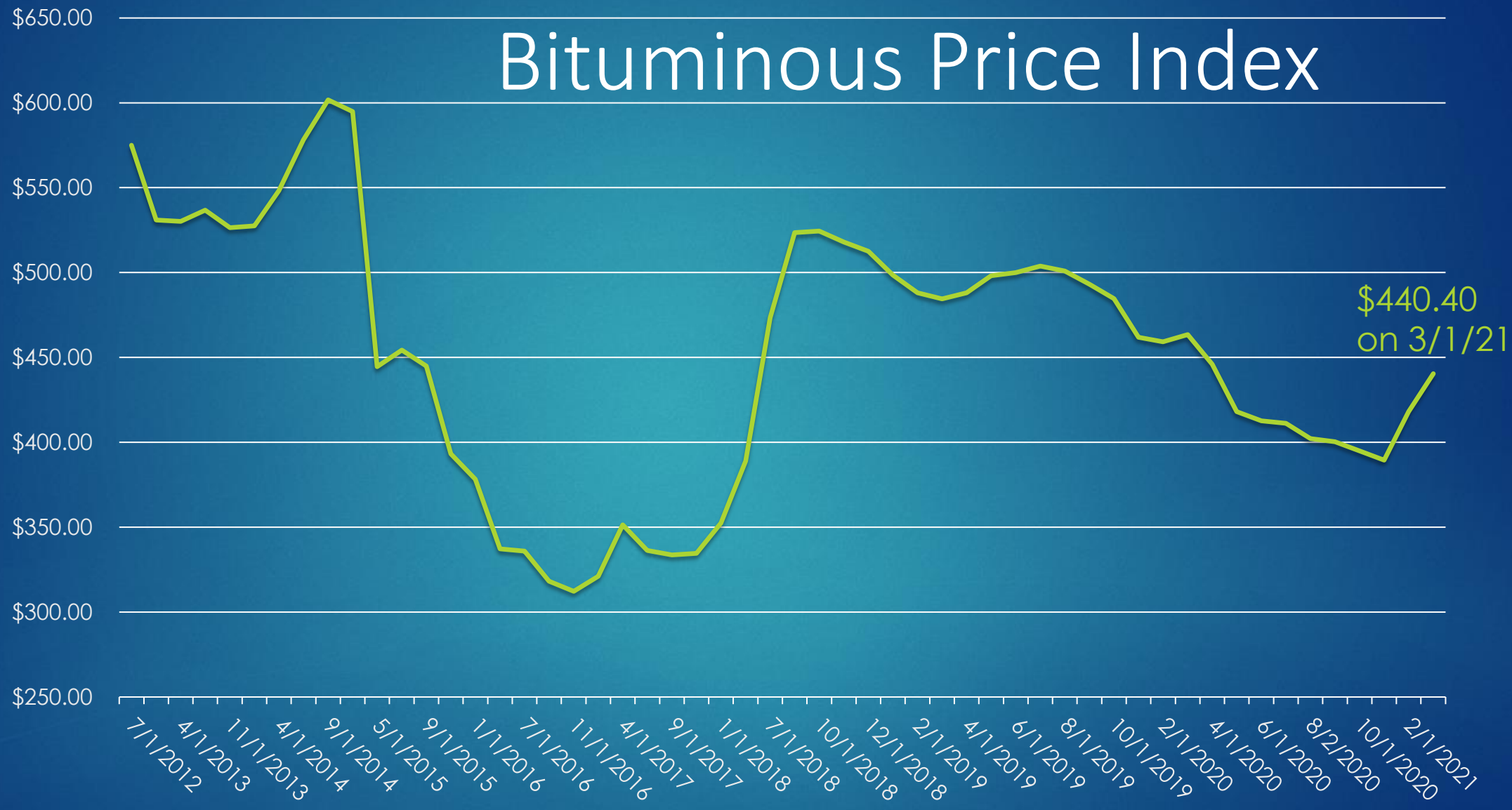
# IDOT Hot-Mix Asphalt Trends

- 2021 projected: 3.8M tons (November-June lettings, not incl. carry-over work)
- 2020 projected: 4.2M tons
- 2020 actual: 6.1M tons
- 2019: 4.7M tons
- 2018: 3.2M tons
- 2017: 4.7M tons
- 2016: 4.6M tons
- 2015: 7.0M tons

# Binder Grade Usage




Percent Polymer Used vs. Time
Percent Polymer Used
45
40
35
30
25
20
15
10
5
0
19.3
22
34.7
39.1
33.2
34.1
31.5
25.3
42.8
35.1
40.5
38.8
35.8
35.9
2004
2005
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Year of Use


Bituminous Price Index
$650.00
$600.00
$550.00
$500.00
$450.00
$400.00
$350.00
$300.00
$250.00
$440.40
on 3/1/21
7/1/2012
4/1/2013
11/1/2013
4/1/2014
9/1/2014
5/1/2015
9/1/2015
1/1/2016
7/1/2016
11/1/2016
4/1/2017
9/1/2017
1/1/2018
7/1/2018
10/1/2018
12/1/2018
2/1/2019
4/1/2019
6/1/2019
8/1/2019
10/1/2019
2/1/2020
4/1/2020
6/1/2020
8/2/2020
10/1/2020
2/1/2021

# ICT Study on Binder Modifiers

ICT Research Team

- Dr. BK Sharma
- Dr. Hasan Ozer
- Dr. Imad Al-Qadi
- Punit Singhvi
- Javier J. García Mainieri

Technical Review Panel

- Kelly Morse, IDOT (chair)
- Dennis Bachman, FHWA
- Kevin Burke III, IAPA
- Andrew Cascione, Flint Hills Resources
- Ross Bentsen, ISTHA
- Jim Trepanier, IDOT
- Brian Hill, IDOT
- Ron Price, IDOT
- Clay Snyder, IDOT
- Justin Grant, IDOT
- Brian Pfeifer, IDOT

# ICT Study on Binder Modifiers

| Modifier ID | Type |
|---|---|
| K | ReOB |
| H | Petroleum based |
| A | Veg. oil |
| D | Bio oil Blend |
| E | Mod. Veg oil |
| F | Mod. Veg oil |
| I | Soybean oil, Methyl ester |
| J | Vegetable oil |
| B | Fatty acid derivatives |
| C | Fatty acid derivatives |
| G | Glycol amine |
| L | from field section |

# Rheological Properties

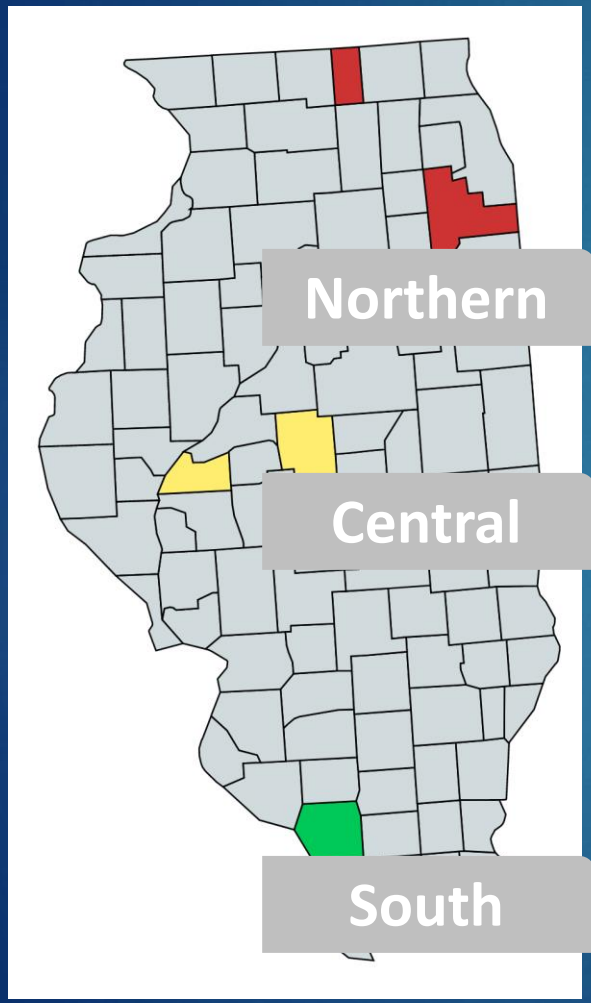
- $\Delta T_c$
- Glover-Rowe Parameters
- $\Delta G^*$ using Linear Amplitude Sweep (LAS) – new concept
- Black Angle, etc.

- Using existing equipment and procedures, DSR and BBR, LAS using DSR
- Analyzing the data differently

# Chemical Properties

- Tools to identify types of modifiers, changes
- FTIR, molecular weight distribution
- Eventually may include pass/fail criteria – Oxidation Indices

# Field Cores




| Field Core ID | District | Binder PG | Year of Construction | Year of Coring | Age |
|---|---|---|---|---|---|
| I-355 | D2 | 64-22 | 2007 | 2018 | 11 yrs |
| I-90 | D1 | 64-22 | 2006 | 2018 | 12 yrs |
| 22STR2 | D2 | 58-22 | 2004 | 2014 | 10 yrs |
| 2RT26 | D2 | **76-28** | 2004 | 2014 | 10 yrs |
| ICT L1 | D5 | 64-22 | 2008 | 2019 | 11 yrs |
| ICT L2 | D5 | 64-22 | 2009 | 2019 | 10 yrs |
| IL-125 | D6 | 64-22 | 2009 | 2018 | 9 yrs |
| I-72 1E | D6 | 64-22 | 2003 | 2013 | 10 yrs |
| US-51 | D8 | 64-22 | 2001 | 2018 | 17 yrs |

# Field Cores

- Looked at extracted binders and lab binder results from RTFO-aged, and 1, 2, & 3 PAV
- 1PAV does not represent field aging in IL
- 2PAV correlated well with aging in cores near surface

# New Binder Protocol

- From ICT Study Recommendations
  - Develop Special Provision and Update Policy Memo
  - Allow Binder Modifiers
  - Initial Testing
  - Routine/Ongoing Testing

# PG Selection Table for Overlays D1 – D6 (On Hold)

| Type of Pavement | Layer | Illinois $N_{design}$ Number | Design ESALs (million) | PG Binder Grade | | |
|---|---|---|---|---|---|---|
| | | | | Traffic Loading Rate | | |
| | | | | Standard | Slow or High ESALs | Standing |
| Overlay of PCC or Composite Pavement | Surface or Binder | 30 | ≤ 0.3 | ~~PG58-22~~ PG58-28 | ~~PG64-22~~ PG58-28 | ~~PG64-22~~ PG58-28 |
| | | 50 | > 0.3 to 3 | ~~PG64-22~~ PG58-28 | ~~SBS PG70-22~~ SBS PG70-28 | ~~SBS PG76-22~~ SBS PG76-28 |
| | | 70 | > 3 to 10 | ~~PG64-22~~ PG58-28 | ~~SBS PG70-22~~ SBS PG70-28 | ~~SBS PG76-22~~ SBS PG76-28 |
| | | 90 | > 10 | ~~SBS PG70-22~~ PG70-28 | ~~SBS PG70-22~~ SBS PG70-28 | ~~SBS PG76-22~~ SBS PG76-28 |

# I-FIT Implementation - 2021

- As-Produced I-FIT Testing required for **All** Mixes
- Asphalt Binder Performance Protocol Under Development
  - No Binder Modifiers in 2021
  - No LTA Testing Requirement for Surface Mixes in 2021
- Long Term Aged I-FIT Testing for **All Surface** Mixes *(For Informational Purposes Only)*

# I-FIT Implementation - 2022

- Continue As-Produced I-FIT Testing for **All** Mixes
- Asphalt Binder Performance Protocol
  - Begin Allowing Binder Modifiers
- Long Term Aged I-FIT Testing for **All Surface** Mixes

# Flexibility Index Minimum Requirements

| Illinois Modified AASHTO *TP 124* (I-FIT) | | |
|---|---|---|
| Mixture | Short Term Aged (STA) Minimum FI | Long Term Aged (LTA) Minimum FI |
| SMA | ~~18.0~~ **16.0** | ~~12.0~~ **10.0** |
| IL-4.75 | 12.0 | |

# 2022 Spec Book

- QC/QA Revised to meet Federal Regulations
- PFP & QCP added to Section 1030
- 40+ Documents updated for Clarity & Consistency
  - Std Specs, Special Provisions, Policy Memos, Procedures, Design Manual, etc.
- District 1 & Statewide RAP/RAS Special Provision Consolidated & Incorporated into Section 1031
- QC/QA for Local Agencies TBD

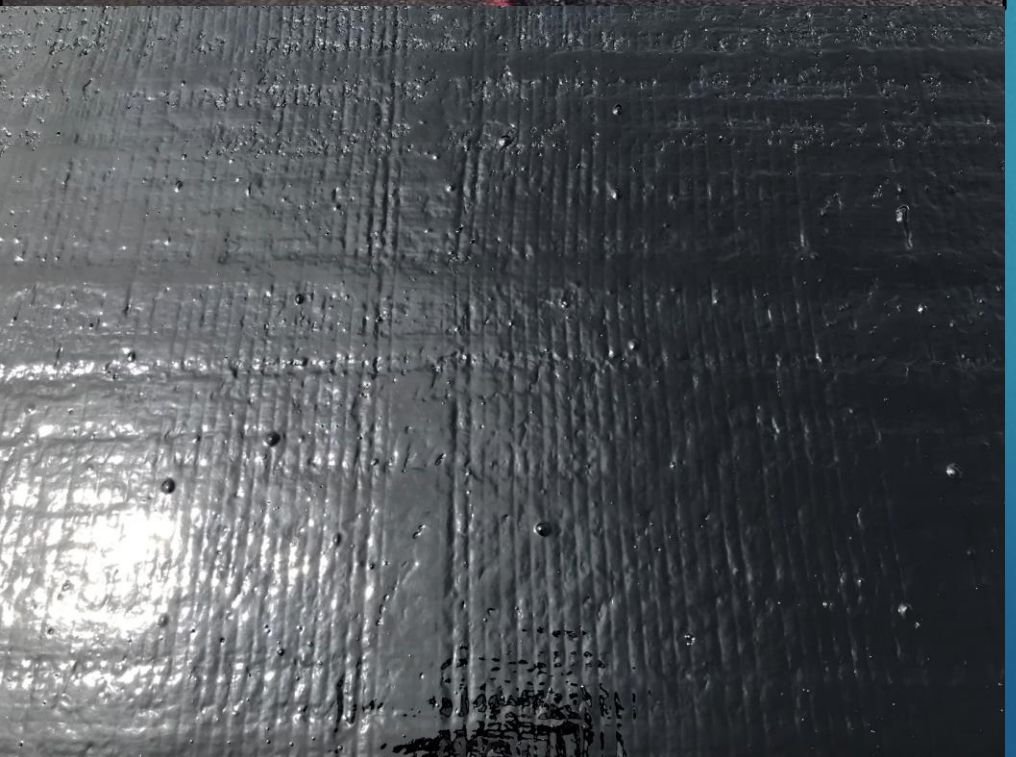
# Emergency BDE Special Provisions January 2021 Letting

- New Statewide RAP/RAS Special Provision
  - Statewide & District One RAP/RAS Special Provisions Consolidated
    - Features a blend of the two specifications
    - Vetted through HMA TWG Meeting
- I-FIT Special Provision
  - Long Term Aging Requirements Removed for 2021
  - Relaxed Hamburg Wheel Requirements for IL-4.75

# Full Lane Sealant (FLS)

# Full Lane Sealant

- Experimental Sections in Districts 2 and 5, placed in 2018
- Annual Distress Surveys
  - No Difference Between Control and FLS Sections



# FLS Waterproofing System

- Uses FLS and Low Permeability HMA Mixtures that Achieve High Density with Static Rolling
- Prevents Ingress of Water and Chlorides
- More Efficient and Cost-Effective Construction

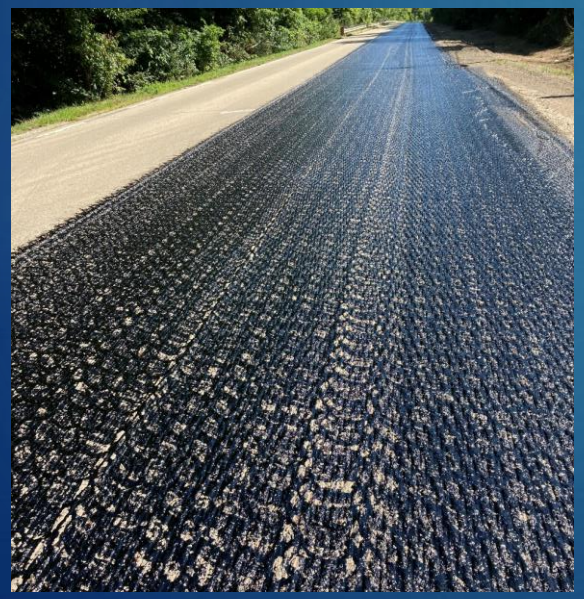
The FLS Waterproofing System is working well on all sites applied

Chloride ingress has been stopped & the pavement surfaces are holding up very well.

# Wax-Modified Hot Applied Asphalt Tack Coat (WMT)

- Experimental Feature Workplan
- Worked with Industry to develop a material specification
- Chemical Test Unit evaluated & characterized the materials
- Districts 4 & 6 applied the material in 2020

District 4 68F24, WMT application
District 6 application was similar



Not Ready for Prime Time, CMB will continue to work with Industry to improve

# Lake Land College QMP Training

- Developing a Recertification Program
  - 5 years beginning in Fall 2022
  - Phase-in Starting with >15 Years, 10-15 Years, etc.
  - Online Review Sessions
  - Online Tests at Highest Level but will include Lower Levels
  - 5-Day Aggregate & Level I  Techs will have Proficiency Tests

# Construction & Materials Management System (CMMS)

- Developing Materials Functionality
  - Pilots starting late April, ~3 per District
- Mix Designs – Upload Data from QMP Package
  - Next phase will replace QMP Package

# Thank You!

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