Research Team

• January 2018: Kick-off meeting
  • IDOT Central Bureau of Materials
  • Illinois Asphalt Pavement Association (IAPA)
  • Federal Highway Administration
  • University of Illinois (UIUC) ICT
  • Arizona State University
  • University of Nevada
  • INTERRA Inc.

• Completed December 2019
Technical Review Members

- James Trepanier (Chairman)
- Dr. Imad Al-Qadi (PI)
- Jose Rivera-Perez (Graduate Student)
- David Lippert
- John Huang
Purpose of Research

Difference between QC and QA results...
Payment vs Quality

Were to begin

Questionnaire....QC and QA All Districts and HMA contractors

Review of literature and 2015 thru 2017 test results
QCP and PFP pay factors
MISTIC and Sequel server for test results
Statewide and District 1 HMA Round Robin results

2018 Site visits...selected Districts and IDOT testing labs

General review of the lab and question/answer section
Observation of job site procedures/sampling/splitting and lab testing
Review of 2015-2017 Data

Research Dilemma:
who’s numbers is correct QC or QA?

ICT report analyzed all the numbers and formulas
Chapter 2, 3 and 4

• Reference: MISTIC
Sequel Server
QCQA package
Thank You to everyone that helped (2018)

- District 1: 5 different contractors spread to cover the entire district
- District 2: 1 contract
- District 5: 1 contract
- District 6: 1 contract
- District 8: 2 different contractors
- District 9: 1 contract

Total: 11 projects
General Understanding of Testing Programs

- **Method:** IDOT production control and sample testing (Design)

- **QC/QA:** Contractor controlled production and IDOT sample testing

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General Understanding of Testing Programs

- **PFP:** Contracts of > 8000 tons of a single mix
  QC does production control and test mix and cores
  QA tests mix and cores for pay factor
  Challenges are allowed

- **QCP:** Contracts < 8000 tons of a single mix
  QC does the production control and test mix
  QA test mix and cores for step pay factor
  No Challenges

**Test variables:** Voids, VMA and Density
2018 Site observations

- Plant and QC and QA lab condition
- Mix sampling (MTV, Quartermaster, augers, mat with/without plates)
- **Blending and splitting**
- Density sampling
- Security of samples and Identification
- Lab procedures (QC and QA)
- Test results review

Plant and Lab conditions
Must comply to IL Mod. T248
Samples and security

Asphalt Forensics

- Past Projects QC vs QA
- Production
  - Ingredients
  - Handling
  - Rates
  - Dust controls
- Testing procedures
  - Mix Design
  - Round Robin
  - Equipment
  - Techniques

Note: review of Gmm, Gmb, AC% and minus #200
Production

- Ingredients: Aggregate Supplier moved location in the quarry
- Handling: Small confined stockpiles
- Mix design vs production

Production Issues

- Reading Dataloggers vs Interpolations of the report
- Use of positive dust control
Production (switching and hot stops)

Case: Well-Controlled AC

Testing (2018 Site Visit)

- Mix Design
- MISTIC/Sequel Server
- QCQA Package
- Round Robin
Lab Observations (Testing):

- Splitting and re-blending
- Re-heating
- Gyratories
- AC determination
- Test sizes
- Process on cores
Cliff notes on QCP and PFP (2015-2017 data): **Findings**

- More QCP projects than PFP
- PFP has higher pay reductions than QCP project
- Over the last three seasons Contractors increased their pay on QCP
- Density was the major reason for reduction (especially on PFP) compared to the other components in pay factor calculations it is followed by air voids and VMA

“Cliff” notes and Hi-Lights of 2018 site visits

- Most QC managers understood the ins and outs of the programs (ones visited)
- QC staffs knew their responsibilities, some better than others
- Some QC departments had unique practices that improved on their production and pay factors
- Consistency and communication
- Experienced QA personnel does make a difference
- QA tried to follow the intent of the program, while still looking out for the best interest of the Department
Practical Tips for Construction

- Pre-pave have the inspectors attend meeting...discussion on where splitting is going to happen and how cores are to be labeled/secured
- Random Numbers.... Do’s and don’ts

Practical Tips

- Record the time and tonnage on when the HMA sample was taken
Construction

- Look at the location where the splitting is being performed...is it safe and level? If not tell someone and take pictures

Construction (Density)

- Innovations are coming
  - Rollers
  - Intelligent Compaction
  - Infrared scanning
  - WMA and rejuvenators
  - Longitudinal joint sealants/RPE

Density Variability

- Reduces voids over rough surfaces leads to lower density variability through vibration
Materials

• Consistency
• Experience
• Mix design
• Forensics (pictures of DL)
• Plant and jobsite visits still needed

Report recommendations

• Limit mix switches
• Positive dust control
• Stockpile handling
• Cold feed control
• Sampling location
• Sampling, blending, splitting and reheating
• Gyratory monitoring (round robin)
• Training
New PFP Pay Factor Helps Contractors!

- Recalculated Pay Factors.

Old: \( \text{PF} = 53 + 0.5 \text{ (PWL)} \)

Current: \( \text{PF} = 55 + 0.5 \text{ (PWL)} \)

Incentive would be increased by 22%}

Summary

- ~80% of the results, according to the Mann Whitney, are in agreement between contractors and districts
  - The variability and loss of pay in those cases are mainly related to production and construction issues
- For the results that don't agree, the major issue driving the differences is the \( G_{mb} \) test results:
  - Possible sources: Gyratory compactor, reheating, and sample test weights
Understanding Risk

Design
Production
Laydown
Analysis

PAY SUMMARY

Combined Pay Factors

VOIDS (39%)  VMA (39%)  DENSITY (22%)

103.3  105.0  92.8

Composite Pay Factor

99.6 %

Bid Price (per ton)

$110.00

PFP Tonnage

20000

PFP DISCRIMINATIVE

-$8,800.00

XXX12600
Good, Bad, and Ugly

Voids (Production)
Density (site conditions)
VMA (Design)

VMA (Risks)

- Aggregate source
  - Consistency
  - Communications
  - Replenishing timing
- Blend of Aggregate
  - Hitting the minimum
  - Dust
- Recycled products
  - In house
  - purchase
Practices that may have payment risks

Reducing risk during Laydown

- Rate of paving
- Trucking & Mix handling
- Equipment and Compaction
- Communication
- Sampling/Blending
- Core handling
Practical tips on Forensics

- Datalogger Temperature Chart review
- Tonnages and time (take pictures)
- Review test weights vs test results
- Communicate vs pointing of fingers
- Training

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Thank You

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\text{Ego} = \frac{1}{\text{Knowledge}}
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"More the Knowledge
Lesser the Ego,
Lesser the Knowledge
More the Ego..."

-Albert Einstein.