QA Specification for Binders
AN UPDATE

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NEAU/PG Meeting

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Background

- Objective: Supplement AASHTO PP26 Standard Practice for Certifying Suppliers
  - ✓ Addresses quality control
  - ✓ QC Plans are well established in region
- PP26 does <u>not</u> address quality assurance
  - ✓ No universally accepted quality assurance plan for binders
- NECEPT has been charged with developing a quality assurance plan for the northeast

Some Questions - Early Answers

- Retain supplier certification? YES
  - ✓PP26 still guiding document
- Payment and acceptance at HMA plant? YES
  - ✓HMA Producer samples at plant
- HMA responsible for their activities? YES
- Statistically based? YES
- Include conflict resolution? YES
- Include payment schedule? YES

Complimentary Activities

- Split Sampling Program
  - ✓Establish variability and bias
- Simulation Programs
  - ✓Simulate payment schedule and user-producer within and between variability
- Database
  - ✓Means for storing and analyzing data
- Common Certificate of Analysis
  - ✓Means for rational data entry - tracking

Complimentary Activities - cont'd

- Payment schedule
- Manual of Binder testing
  - Updated for latest AASHTO revisions
  - Includes DT
- Technician Certification Program

Split Sampling Program - Status

- Three sets two samples sent to date
- Fourth set currently under test
- Sets five and six planned for:
  - March
  - April
- Summary statistics posted on Web Site
- More detailed data analysis now underway

9 @ 2 to 3s, 4 Outliers

Split Sampling Analysis, Sample SS-1

Property	Total No.	± 1s	± 2s	± 3s	> 3s
Rotational Viscosity	30	22	4	2	2
Mass Change	30	21	8	1	0
G*/sinδ, Tank	31	23	5	2	1
G*/sinδ, RTFOT	31	19	12	0	0
G*sinδ, PAV	29	21	6	2	0
S(60)	31	24	4	2	1
M(60)	31	19	12	0	0

17 @ 2 to 3s, 0 Outliers

Split Sampling Analysis, Sample SS-2

Property	Total No.	± 1s	± 2s	± 3s	> 3s
Rotational Viscosity	30	20	7	3	0
Mass Change	30	20	8	2	0
G*/sinδ, Tank	29	22	5	2	0
G*/sinδ, RTFOT	29	21	5	3	0
G*sinδ, PAV	28	19	7	2	0
S(60)	31	23	6	2	0
M(60)	31	26	2	3	0

13 @ 2 to 3s, 4 Outliers

Split Sampling Analysis, Sample SS-3

Property	Total No.	$\pm$ 1s	$\pm$ 2s	$\pm$ 3s	> 3s
Rotational Viscosity	29	18	7	2	2
Mass Change	29	26	0	3	0
G*/sinδ, Tank	29	22	5	2	0
G*/sinδ, RTFOT	29	22	6	1	0
G*sinδ, PAV	29	21	6	2	0
S(60)	29	20	6	2	1
M(60)	29	20	7	1	1

11 @ 2 to 3s, 5 Outliers

Split Sampling Analysis, Sample SS-4

Property	Total No.	$\pm$ 1s	$\pm$ 2s	$\pm$ 3s	> 3s
Rotational Viscosity	29	17	8	1	3
Mass Change	29	19	8	2	0
G*/sinδ, Tank	29	21	5	2	1
G*/sinδ, RTFOT	28	21	5	2	0
G*sinδ, PAV	29	22	5	2	0
S(60)	29	20	6	2	1
M(60)	29	20	7	2	0

Observations

- Need additional training and continuation of technician certification program
- Need improved sampling procedures
    - Not well defined - better guidelines
    - Training and enforcement
- Need to better identify samples/test data
   - Difficult to link supplier tank and lot with lot and sub-lot at HMA plant

Sources of Variability

- Material variability – inherent variability
    - Production related
- Testing variability
    - Attributed to laboratory and technician
    - Technique-equipment within laboratory
    - Random effect
- Laboratory bias
    - Systematic error within laboratory
    - Affect _average_ of one lab versus other

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Sources of variability, cont'd

- Sampling procedures
  - ✓ At producer, HMA plant, etc.
- Shipping and handling
  - ✓ Contamination, tank uniformity, etc.
- Question – who is responsible for each of these sources of variability?
  - ✓ Need to consider in specification
- Agency's concern is simple:
    "what is the material in the pavement"

Distribution Flow Diagram

Tank or Lot

ABZ Oil

1
2
3
4
5

Broker John

Hot Pave
PA

Big Pave
NY

Fast Pave
CT
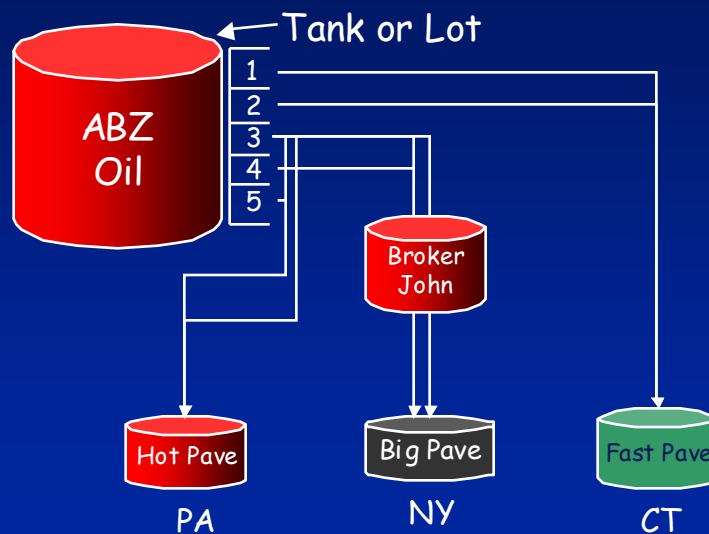
Simulation Programs

- Developed simulation program to:
  - ✓ Calculate payment schedule
  - ✓ Estimate average payment
  - ✓ Estimate producer risk of rejecting good lot
- Available for download from web site effective February 23rd 2001

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Simulation Program -
Producer Risk

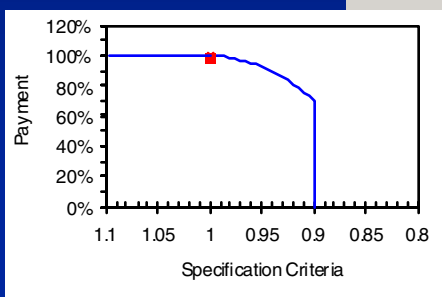Probability of producer rejecting an acceptable lot for given production level and testing variability

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Simulation Program -
Payment Schedule

Calculates
payment schedule

Simulation Program -
Expected Payment Simulation Variables

- ➢ User and Producer Variability
- ➢ User and Producer bias
- ➢ Number of samples - User and Producer
- ➢ Values for assumed production
- ➢ Payment schedule variables
    - ✓ Threshold and payment at threshold
- ➢ Solve for
    - ✓ Expected payment assuming production level
    - ✓ Production level for assumed payment

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Simulation Program - Expected Payment

Assumed Standard Deviation for Testing	Producer	User	Production Measured Values		Lab Bias (%)	Producer	User
G*/sin(delta) (Unaged): (D1s, Single Operator)	0.034	0.034	G*/sin(delta) (Unaged):	1.00		0	0
G*/sin(delta) (RTFOT Residue): (D1s, Single Operator)	0.039	0.039	G*/sin(delta) (RTFOT Residue):	2.20		0	0
G*sin(delta) (PAV Residue): (D1s, Single Operator)	0.079	0.079	G*sin(delta) (PAV Residue):	5.00		0	0
S(60) (PAV Residue): (D1s, Single Operator)	0.037	0.037	S(60) (PAV Residue):	300		0	0
m(60) (PAV Residue): (D1s, Single Operator)	0.018	0.018	m(60) (PAV Residue):	0.300		0	0

Reset Default Values

Number of Replicated measurements: Producer 1 User 1

Note: Standard deviation values may be entered by user.
Default values may be obtained by pressing button above.

Simulate   Change PTV or TV   Change Assumed Production Values

Click on the icone above to start the program   Click on the icon above to change Threshold Values (TV) or Payment at Threshold Values (PTV)

Common database and COA

N
E
C
E
P
T

➢ Discussed January 4th and January 23rd
  ✓ Established format
➢ Advantages
  ✓ Same data to all agencies
  ✓ Easy to compare user-producer data
  ✓ Comparison can be done across state lines
  ✓ Unique identifiers for region
  ✓ Laboratory bias clearly identified

Key Elements of Database

➢ Unique sample designation
➢ Tables for producer and user
➢ Indication of:
  ✓ Modification, handling instructions, supplemental data, non-standard report
➢ Identification of HMA producer
➢ DTT data and critical cracking temperature
➢ Supplemental data
➢ User-friendliness

Common COA

Name of Supplier-Terminal	WBPE
Lot No.	1234
Tank No.	6789
Date	01/08-01

WBPE 1234 6789 008

Gives unique number that identifies material at terminal, HMA, or user

Selection of Acceptance Limits

1. Relate non-compliance to pavement performance
   - ✓ Most desirable approach
   - ✓ Impossible – models do not exist
2. Base acceptance limits on testing variability
   - ✓ Use D2S to estimate change in grading temperature associated with D2S
   - ✓ Testing variability should be no more than partial grade to be realistic
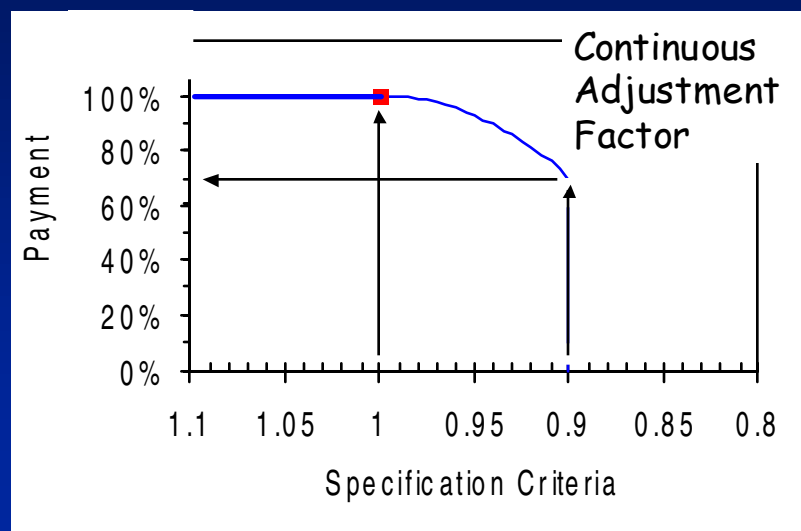
Acceptance/Payment Protocol

➢ Accept on HMA lot basis
   - ✓ Stratified random sampling of binder
   - ✓ Sublots within lot
   - ✓ Test random sublot
   - ✓ Test results indicate if HMA lot is in compliance
   - ✓ Additional testing if not in compliance
➢ Definition of lots and sub-lots agency specific

Payment Adjustment Factor

- Base acceptance on testing variability (D2S)
  - ✓ Frequency of non-conformance controlled to protect producer and user
  - ✓ Continuous factor as opposed to discrete
  - ✓ Rejection level at D2S
- Provision to limit continuous non-conformance
- Conflict resolution accommodated

Payment Schedule

Continuous Adjustment Factor

Payment: 100%, 80%, 60%, 40%, 20%, 0%

Specification Criteria: 1.1, 1.05, 1, 0.95, 0.9, 0.85, 0.8

Remaining Issues

- Select threshold values and payment at threshold values
  - ✓ Demonstrate fairness to user/producer
- Establish conflict resolution protocol
- Conduct field trials

Summary

- Realistic acceptance and payment plan is feasible
  - ✓ Testing capabilities are adequate
- Supporting elements needed
  - ✓ split sampling program
  - ✓ regional database
- continued training and tech certification Need to simulate and refine specification in year 2001
- Expect implementation 2002