

# RECOVERY OF ASPHALT CEMENT FROM PAVEMENTS AND PGAC TESTING

Sandy Brown

Technical Director, Ontario Hot Mix Producers Association

Canadian Regional Engineer, Asphalt Institute



[www.ohmpa.org](http://www.ohmpa.org)




# Outline



- Why we do testing
- Sampling issues – representative samples
- Recovery issues – solvents, Abson or Rotavapor
- Testing issues – repeatability

# Why?



- If the test results at the time of construction are off, it's fixed during construction
- If the testing at the time of construction looks good and the performance looks good, we don't need testing
- We only need to do testing of the pavement if the performance is poor

# What Affects Performance



- Environment – did we have any unusual weather conditions
  - Unusually high temperature – rutting
  - Unusually low temperature – cracking
  - Unusual traffic conditions (staged construction, heavy loads, changing use, etc.) – fatigue cracking
- Mix design specs – not enough AC in the mix leads to fatigue cracking
- Poor construction (lack of compaction) – fatigue cracking



# Sampling Issues



- Coring issues – location
  - Getting a representative sample – contamination issue
  - Tire wear and brake pad wear – surface contamination
  - Combustion products from exhaust
  - NCHRP Rpt 767, *Measuring and Removing Dissolved Metals from Stormwater in Highly Urbanized Areas*
- Sample contamination from the coring process
  - Dry vs wet coring
  - Core transportation and storage
- No agreement on preventing contamination

# Recovery issues

- Solvent – all solvents will affect the properties of the asphalt cement to various degrees, also varies with exposure time and condition of the solvent
- Recovering the solvent and the asphalt cement
  - Rotarex extractors – fines loss with the solvent solution
  - High speed centrifuge – does that get all the fines out (one pass, two passes?)
- No agreement on solvent or recovery procedures
- ASTM D7906-14, *Standard Practice for Recovery of Asphalt from Solution Using Toluene and the Rotary Evaporator* – warning in spec not to use the procedure for acceptance

# Removing the solvent



- Two processes – both work if the spec is followed
  - Abson – boiling at higher and higher temp under vacuum
  - Rotavap – solvent in a flask rotating in heated oil under vacuum
- How to get all the solvent out?
  - Increase temperature – may affect the asphalt cement
  - Lower the pressure – vacuum degassing apparatus
  - Run the sample through the RTFO
- No agreement on which process or how to remove the last of the solvent

# Is there really a reason for concern

## MTO Study - Testing on recovered PGAC obtained from the mix for the 5th round of HM correlation - December 2014

	Average Ash Content { % }		TruGrade Temperature (High )		TruGrade Temperature After RTFO (High)		TruGrade Temperature After PAV (Low)	
	Abson	Rotavap	Abson	Rotavap	Abson	Rotavap	Abson	Rotavap
Lab 1	<b>0.72</b>		78.0		80.2		-23.4	
Lab 2	1.09	1.16	79.5	<b>74.0</b>	82.6	82.1	-20.0	-20.8
Lab 3		0.74		<b>85.2</b>		<b>91.2</b>		<b>-18.6</b>
Lab 4			76.9	77.8	79.3	<b>78.6</b>	-23.4	-25.1
Lab 5	<b>2.14</b>				82.2		<b>-25.5</b>	
Lab 6	0.88		82.1		84.0		-22.0	
Average	1.21	0.95	79.1	79.0	81.7	84.0	-22.9	-21.5
StDev	0.64		2.24	5.70	1.88	6.49	2.03	3.31
CoVar	53.1		2.80	7.20	2.30	7.70	8.90	15.40
Range	1.42	0.42	5.16	11.2	4.63	12.56	5.5	6.5
Count	4	2	4	3	5	3	5	3
Overall StDev	0.530		3.65		3.95		2.44	
Overall Range	1.42		11.20		12.56		6.90	



## Testing on recovered PGAC obtained from the mix for the HM correlation - December 2014 and June 2015

### December 2014 Correlation - from 5th round of HM correlation

	Average Ash Content (%)		TruGrade Temperature ( High )		TruGrade Temperature After RTFO (High)		TruGrade Temperature After PAV (Intermediate)		TruGrade Temperature (low)	
	Abson	Rotavapor	Abson	Rotavapor	Abson	Rotavapor	Abson	Rotavapor	Abson	Rotavapor
Avg	0.74	0.95	79.12	78.98	81.65	83.98	17.76		-22.86	-21.50
StDev	0.35		2.24	5.70	1.88	6.49	0.70		2.03	3.31
COV	47.8		2.8	7.2	2.3	7.7	4.0		8.9	15.4
# of Labs	4	2	4	3	5	3	5	2	5	3

### June 2015 Correlation - from 1st round of HM correlation

	Average Ash Content (%)		TruGrade Temperature ( High )		TruGrade Temperature After RTFO (High)		TruGrade Temperature After PAV (Intermediate)		TruGrade Temperature (low)	
	Abson	Rotavapor	Abson	Rotavapor	Abson	Rotavapor	Abson	Rotavapor	Abson	Rotavapor
Avg	3.54	2.40	82.62	81.27	82.27	84.21	22.80	22.04	-23.20	-22.45
StDev	3.11	0.94	2.93	3.05	3.01	6.32	2.39	0.08	1.10	3.22
COV	87.8	39.2	3.6	3.8	3.7	7.5	10.5	0.4	4.8	14.3
# of Labs	5	4	5	4	5	3	4	2	5	4

***Thanks!***