Binder ETG REOB

* Review of several binder and VTAE blends

Lab Blends VTAE %	AASHTO M 320, Table 1, PG continuous grade & Difference between S and m grade temperature					
	0	2	4	6	8	20
Marathon PG 64-22 w/VTAE 1	67.3-26.2	68.3-25.0	64.9-26.5	64.2-27.6	62.6-26.5	55.6-26.6
Difference Between S & m grade	-1.5	-4.6	-3.6	-3.7	-6.9	-15.2
Marathon PG 64-22 w/VTAE 2		65.9-24.8	66.0-25.7	65.6-25.9	64.9-27.6	61.5-26.0
Difference Between S & m grade		2.2	-4.6	-5.7	-4.5	-9.8
BP PG 64-22 w/VTAE 1	66.5-25.9	64.7-26.7	63.9-27.2	62.6-28.1	61.0-27.4	55.8-29.8
Difference Between S & m grade	0.2	-0.5	-1.8	-2.5	-4.8	-7.9
BP PG 64-22 w/VTAE 2		65.5-26.0	64.3-27.1	63.9-27.7	63.3-27.3	60.1-31.0
Difference Between S & m grade		-3.7	-4.3	-5.7	-4.5	-12.1

Table 2. Blends of VTAE and matched blends made with HVGO flux oil.

Lab Blends %	AASHTO M 320, Table 1, PG continuous grade & Difference between S and m grade temperature							
	Control	2% VTAE	Control 4%	4% VTAE	Contol 6%	6% VTAE	6% VTAE & 0.5% AS	10% VTAE
AASHTO M 320 SUPERPAVE™ Binder Grade, PG:	64-22	64-22	58-22	58-22	58-22	58-22	58-22	58-28
True Grade	66.2 - 25.61	64.6 - 26.92	62.7 - 27.08	63.1 - 26.93	61.9 - 27.88	62.0 - 27.45	61.2 - 29.09	59.8 - 28.83
Difference Between S & m grade	2.3	0.1	-0.7	-0.7	-0.3	-1.2	-1.5	-3.3

Table 3. Binder properties of 64-22 control and VTAE binder blends recovered from 20% RAP mix.

PROPERTY	RESULTS			
	20% RAP			
	Control (PG64)	2% VTAE	6% VTAE	10% VTAE
AASHTO M 320 SUPERPAVE™ Binder Grade, PG:	64.22	64-22	64-22	64-28
True Grade	69.3-24.83	66.0-26.78	66.3-27.77	66.7-28.15
Difference Between S & m grade	**-1.1**	**-1.1**	**-0.4**	**-2.8**

Table 4. Binder properties of 64-22 control and VTAE binder blends recovered from 5% RAS mix

PROPERTY	RESULTS			
	Mix with 5% RAS			
	0.5% Antistrip:			
	Control	VTAE		
		8%	16%	24%
RECOVERED BINDER				
AASHTO M 320 SUPERPAVE™ Binder Grade, PG:	**76-16**	**70-22**	**70-22**	**70-22**
True Grade	**79.7-21.4**	**74.3-24.8**	**73.8-23.2**	**74.4-23.6**
Difference Between S & m grade	**-4.3**	**-5.4**	**-12.6**	**-14.4**

Conclusions

* Both asphalt source and VTAE affect the final rhelogy
* S and m failure temperature difference is a good indication of VTAE quantity and better than additional PAV aging
* VTAE had a mitigating effect on RAP and RAS for S and m difference