THE GREEN MACHINE

Ultrafoam GX System

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Controls

UltraFoam GX Ratio Controller

Plant Modifications

- Piping
- Electrical
- Water supply

The Ultrafoam GX Process

- 300 TPH
- Asphalt cement
  - 5%
  - 315° F
- Virgin aggregate
  - 5% moisture
- RAP 20%
  - 2% moisture
- Target WMA temperature
  - 260° F

The Ultrafoam GX Process

- Exact same mix design as HMA
- Dry and heat aggregates
- Water is added to the AC to foam the asphalt
  - Aggregate and AC coat at a lower temperature

The Ultrafoam GX Process

Water % of AC	Water TPH	Water Lbs/Min.	Water Gal/Min.	Expansion Ratio
1.25	**0.188**	**6.25**	**0.75**	**23.16**
1.50	0.225	7.50	0.90	27.59
1.75	0.263	8.75	1.05	32.03
2.00	0.300	10.00	1.20	36.46

Water demand per hour at 300 tph = 45 gallons

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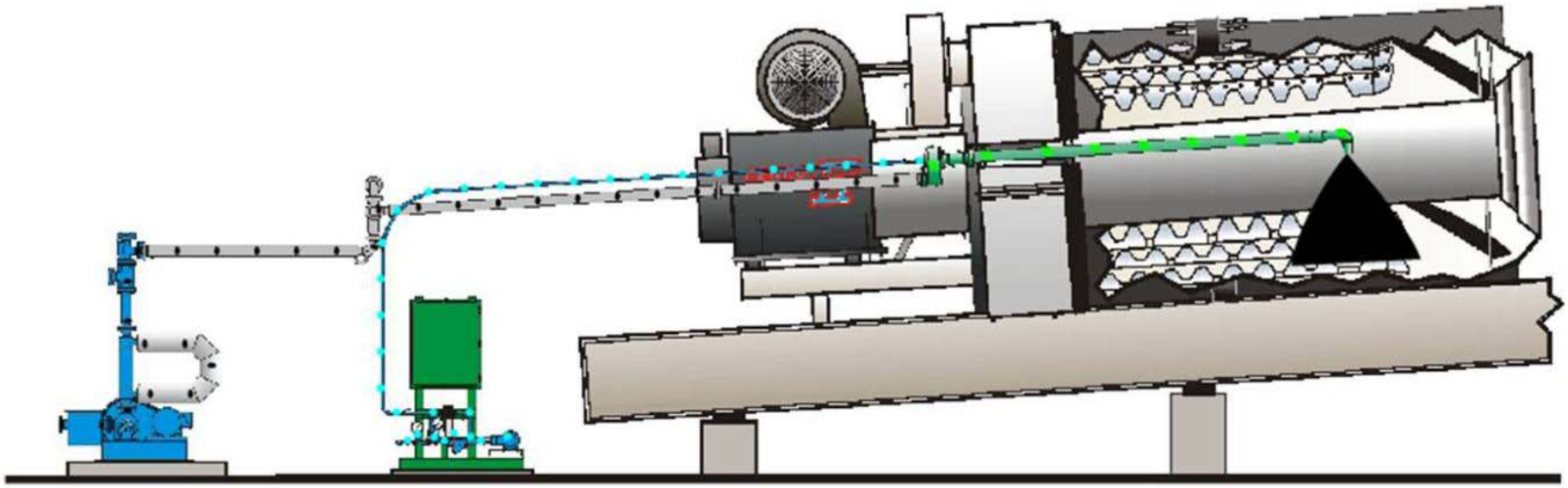

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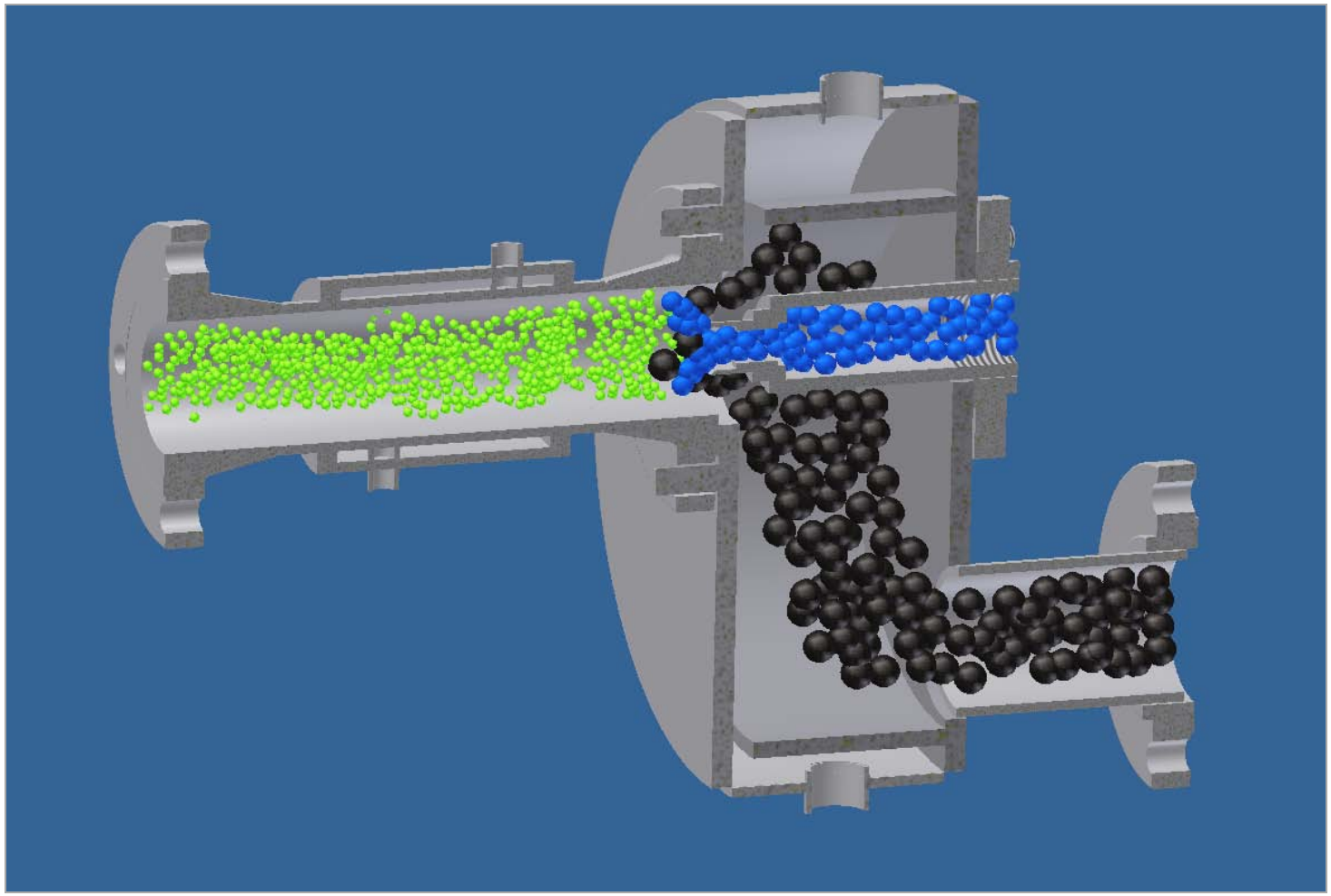

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Field Experience

- Production
- Storage
- Placement
- Compaction
- Field trial

Production

Storage

Placement

Placement

Placement

Compaction

Field Trial

- Illinois DOT – 9/10 and 9/11 2008
  - 1200 tons conventional hotmix
  - 1200 tons Ultrafoam GX mix
- Compaction between 200° F to 240° F
- Pavement density 94%
- Longitudinal densities 92%

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2008 Warm Mix Asphalt Trials

	Dixie Highway Project 9/9/2008		9/10/2008			Ridge Road 10/8/2008
	HMA	WMA	WMA	WMA	Virgin AC	WMA
Tons	730	500	650			
Gmm	2.504	2.517	2.504	2.503		
Gmb	2.469	2.458	2.407	2.419		
Nmax Gmb			2.450			
Va (Ndes)	1.4	2.4	3.9	3.4		
Va (Nmax)			2.2			
AC	5.9	6.1	5.9	6.1		
-#200	6.6	7.7	5.3	5.3		
6" Sability	>5000		>5000			
6" Flow	>35		>35			
50 Blow Stability (lbs)			1600			
50 Blow Flow			14.3			
75 Blow Stability (lbs)			1804			
75 Blow Flow			15.5			
Penetration	40		38		63	
Penetration Change	63.49%		60.32%			
Viscosity	8790		7740		2262	
Viscosity Ratio	3.89		3.42			
TSR	0.81		0.93			0.97
Gyrations to 7%	19		38			
TSR "Unc. Strength" (lbs)	3421		3169			4125
TSR "Cond. Strength" (lbs)	2753		2941			3994
Tensile Strnght (PSI) Unc	97.0		89.9			117.0
Tensile Strnght (PSI) Cond	78.1		83.4			113.3
Reheat Gmm			2.508			
Reheat 240F Gmb			2.397			
Reheat 290F Gmb			2.420			
Silo Moisture (1,2,4,6 hrs)		0.0%	0.0%	0.0%		
Discharge Moisture		0.0%	0.0%	0.0%		

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Field Trial

- State College Township, Pa - 10/17/2008
  - 700 tons surface mix
- 210°F behind screed
- Pavement density 92.8%
- Ambient temperature 52°F

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Field Trial

- Denver, Co – 2/19/2009
  - 200 tons surface mix
    - 20% RAP
- 221°F behind screed
- Pavement density 94.6%
- Ambient temperature 44°F
- TSR 86.4

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NCAT Testing

Hamburg Wheel Tracking (AASHTO 324)

Field produced specimens

Mix	Rutting Rate (mm/hr)	Total Rut Depth (mm) @ 10,000 Cycles	Stripping Inflection Point (cycles)	Average Stripping Inflection Point
WMA	1.260	5.00	4250	
	1.424	5.65	6000	5125
HMA	1.346	5.34	None	
	1.177	4.67	None	None

Hamburg Wheel Tracking (AASHTO 324)

Laboratory aged specimens

Mix	Rutting Rate (mm/hr)	Total Rut Depth (mm) @ 10,000 Cycles	Stripping Inflection Point (cycles)	Average Stripping Inflection Point
WMA	2.293	9.10	4050	
	1.764	7.00	6600	5325
HMA	1.688	6.70	7450	
	1.499	5.95	6270	6860

Ultrafoam GX Advantages

- Efficient system
- Effective system
- Total cost of ownership

Thank you

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