

Warm Mix IN THE Snow

by Sandy Lender

Not many plant managers would show up on a frosty morning and cheerily command, "Fire up the plant!" But among warm mix asphalt's (WMA) benefits is its ability to be worked in cool ambient conditions. So the crew at Century Companies, Inc., Lewistown, Mont., went to work as usual during the frigid conditions of Autumn 2008 at 5,000 feet. The result was not just a project that Business Development Manager John Twedt is proud of, but also a slew of good data concerning the type of WMA process management chose to use.

"We asked the crew to produce mix in some pretty extreme conditions," said Twedt. "One day they got up and it was 17 degrees. So I was pretty pleased with the crew for surviving what was asked of them."

Luckily, the mix they were making included an additive called Advera® WMA, one of many "systems" used to facilitate WMA production. By adding AdveraWMA at a rate of 0.25 percent at the drum, Century employees were able to take their mix temperatures from 325 degrees F when running hot mix asphalt (HMA) to 275 degrees F when running WMA. On the coldest days, the plant ran WMA at 290 degrees F. At all times, testing personnel were on hand to monitor key systems to see whether or not production was enhanced by running WMA. The result was a production process even more environmentally responsible than asphalt typically is and a mix that worked well in the cold conditions.

They started with a portable AEDCO 6628 parallel flow drum plant with a wet scrubber situated at about 5,000 feet elevation. Century Companies operates nine hot plants, seven of which are portable and two of which are batch. To receive mix for this thin lift overlay, the project owner made no demands as to what kind of plant to use. In fact, Twedt presented the idea of using WMA.

Century Companies was awarded the contract Aug. 15, 2008, to supply 8,000 tons of commercial HMA using 58-28 oil with half a percent

liquid antistrip. "After the award, we gave a warm mix asphalt presentation to the owner and they agreed to try it," said Twedt.

Century crews made the mix at their facility in Corwin Springs and the owner picked it up in their trucks, hauling it to the laydown operation about 25 miles south of the plant. This was a 1.5-hour round trip. The elevation at the work zone was about 7,000 feet. There, crews placed a 2-inch leveling course 2.5 miles long and 20-feet wide.

"They layed between 250 and 750 tons per day," said Twedt. "We alternated between WMA and HMA from one day to the next. We started mixing for that site Sept. 25 and finished Oct. 8. After 10 days of milling and prep work, they began laying mix at the second site Oct. 20. That work involved overlaying parking lots and overlaying streets sometimes in the snow. They finished paving Nov. 3.

"They were doing a thin lift overlay. They milled off an existing mat to grade, did some parking lots and performed the 250-tons-a-day kind of work with lots of hand work. I wanted to test warm mix in a cold environment where you had to get your hands dirty. In my opinion, the WMA performed as well or better than the HMA under all circumstances."

Twedt has more than his opinion to prove WMA's performance on this project. As mentioned above, the Century Companies had testing personnel on hand to monitor the efficiencies of WMA versus HMA. While

Figure 1.

Amp Draw at the Slat Conveyor

HMA	92 TPH	308° F mix temperature 355° F stack temperature 18.42 amp draw
WMA	103 TPH	265° F mix temperature 300° F stack temperature 18.25 amp draw

Figure 2.

Emissions Testing at the Stack

	275° F*	290° F* ²	325° F* ³
CO ₂	3.35* ⁴	4.3	4.4
NO _x	1.22 lbs/hr	1.26 lbs/hr	1.23 lbs/hr
VOC	40.9 lbs/hr	44.5 lbs/hr	57.61 lbs/hr

* 275° F mix was run at 115 TPH

*² 290° F mix was run at 105 TPH

*³ 325° F mix was run at 100 TPH

*⁴ unit expressed in percent on a volume basis without moisture (% v/v D)

HMA proved to be the environmentally friendly process the industry is used to, WMA showed its enhanced green benefits as well.

"I wanted to do emissions testing on my own," explained Twedt. "I wanted to spend the money to get it done right. It wasn't required by the project owner at all—I just wanted first-hand data on WMA versus HMA."

He brought in professionals from Energy and Environmental Measurement Corp. (EEMC), Billings, Mont., to do the emissions testing, and BOESH Engineering, Laurel, Mont., to perform the lab work on the properties of the mixes.

"What I tried to do was follow the criteria established by the WMA technical group," continued Twedt. "They suggested that we analyze, among other aspects, the amp draw on the slat. We didn't notice a real appreciable difference there (See Figure 1).

"My observation is that warm mix is a very workable agent. It creates a much better work environment for the worker with less fume, increased workability, easier handwork, better ability to get compaction. We're able to produce mix at a lower temperature. There are efficiencies associated with warm mix such as burner efficiencies, emissions efficiencies, tons per hour, temperature reductions—they were all there."

As seen in Figure 2, emissions results showed a 31.3 percent improvement in Carbon Dioxide (CO₂) from the 325-degree HMA to the 275-degree WMA and a 40.9 percent improvement in volatile organic compounds (VOCs) from the HMA to the WMA.

Emissions efficiencies were just the beginning. "We had a 20 percent reduction in propane consumption at the burner with WMA," added Twedt.

They even documented the performance properties of the WMA.

"We ran the old school Marshall tests and the Superpave gyratory tests, which showed a 1.29 percent reduction in air voids with the warm mix. That goes back to the workability concept."

The tensile strength ratio (TSR) test showed interesting results. The WMA had a 55 pounds per square inch (psi) dry weight and 46 psi wet,

offering a TSR value of 83 percent. The HMA had a 38 psi dry weight and 33 wet, offering a TSR value of 89 percent. (The minimum spec requirement in Montana is 75 percent so the samples were well within limits.) "The integrity of the sample was higher with the warm mix," concluded Twedt.

Moisture retention was an area Twedt took an interest in as well. The stockpile they pulled material from had been sitting in extreme conditions for three years, experiencing rain and snowfall.

"The aggregate was as wet as it could be," said Twedt.

Luckily, drying time and absorption were just right. The mix experienced 0.25 percent moisture retention coming out of the silo with the HMA and 0.384 percent with the WMA. There was no drastic difference and no drastic moisture retention.

"Moisture retention in the mix will make it more susceptible to rutting or stripping so we ran Superpave plugs on everything everyday," said Twedt. "The state of Montana ran a Hamburg rut test on the plugs and found no appreciable difference between the HMA and WMA."

Seeing similar performance and enhanced performance with the WMA product over the HMA product, Twedt came away from the project a proponent for the AdveraWMA additive.

"I was pleased with Advera and the workability of their product," he said. "In Montana, we blow hydrated lime into our mixes. We're set up to dry-handle hydrated lime so we already had the hardware in place to blow the Advera in. All we had to do was plumb it up. In a short period of time, my guys felt relatively comfortable. Now I can move that feeder system around to any of my plants and, in short order, be set up for warm mix."

Considering the success and the results Century Companies saw on this WMA project, that ease of production should come in handy often. **44**