PART 3 WINNING *the* BONUS

PAVER PERFECTION

Paving in echelon at the new National Corvette Museum Motorsports Track in Bowling Green, Kentucky, the Cat AP1055 paver of Scotty's Contracting & Stone receives modified surface mix from a Weiler E2850 remixing transfer vehicle; echelon paving provides a seamless longitudinal joint between paving widths.

Image: Tom Kuennen

Image: Advanced Materials Services

The three-drop method – first drop at front, second drop at rear, and third drop in center of a truck – reduces aggregate roll-down and segregation, especially important when paving large stone mixes.

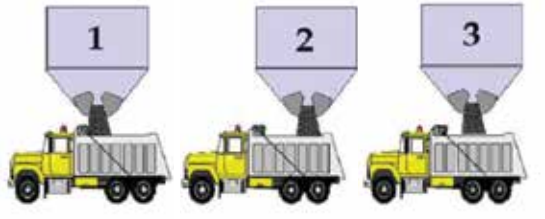

Image: Texas Asphalt Pavement Association

This month, *Equipment World* continues its seven-part series on how to optimize pavement construction to win bonuses with a look at pavers.

Part I: Smooth Pavements through Cold Milling
Part 2: Smooth Pavements and Material Transfer Vehicles
Part 3: Smooth Pavements and Asphalt Pavers
Part 4: Smooth Pavements and Asphalt Screeds
Part 5: Compaction for Super Smooth Asphalt Pavements
Part 6: Super-Smooth PCC Pavements with Slipform Pavers
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Following with cold mills and material transfer vehicles, asphalt pavers are the third element in the quest for smooth, bonus-winning pavements. Pavers are changing as electronics play a bigger-than-ever role, and best-practice principles are built into their design.

The shift from asphalt pavement method specifications to performance specs – with more demanding smoothness requirements – is compelling contractors to take advantage of the technologies built into today's asphalt pavers in order to meet those specs and win bonuses.

For example, for night work, paver-mounted fluorescent lamps gave way to incandescent spotlights, which were in turn replaced by brilliant balloon lights with their dispersed flood of light. In the near future, today's balloon lights will be replaced by 24-volt LED balloon lights, which have fewer operational issues compared to modern 120/240-volt systems.

Still, the basic concept – a tractor and independent screed – has remained unchanged

Two Vögele Vision 5200-2 tracked pavers work in echelon at a high-volume runway job at the Port Columbus International Airport, Ohio.

Image: Tom Kuennen

for decades. An asphalt paver distributes and spreads a lift of asphalt in a right-of-way. "The tractor is the prime mover that is used for self-propulsion of the asphalt equipment," says Dale Starry, global sales training manager for compaction at Volvo Blaw-Knox Construction Equipment. "The screed is the working tool and the equipment that spreads the HMA into asphalt pavement."

The hopper-equipped tractor receives the hot, warm or cold asphalt mix and moves it to the rear of the tractor and the mounted screed, all the while moving forward. Larger Eurostyle asphalt pavers can place premium bituminous mixes in greater, wider quantities, but also can place road base, cement-treated base and roller-compacted concrete.

The tractor is either tracked or rubber-tired, depending on the application and contractor preference. Today's engines meet Tier 4 Interim, or increasingly, Tier 4 Final emission control standards. They also have the muscle to power forward or rear movement, plus hydraulic drives, internal conveyors and augers that move material rearward and laterally to the screed.

Typically, trucks dump paving material into the receiving hopper at the front of the paver, making contact with push-rollers at the front of the paver, and in classic paving practice, the paver then pushes the truck forward.

But, as demonstrated in last month's article in this series, today's best practice paving favors use of material transfer vehicles to isolate the haul truck from the paver, resulting in significantly smoother pavements and reduced thermal and aggregate variation, or segregation, in the mix.

At the bottom of the receiving hopper, wide conveyors move the paving media through a conveyor tunnel beneath the operator's platform to the augers in front of the screed. These augers evenly spread the mix in front of the screed (and can be adjusted in length to match the width of the screed) so a uniform mat is placed before compaction.

The screed itself operates independently of the tractor, securing and compacting the fresh mix using its own mass and internal vibration or tamping functions, if so equipped. (We'll take a closer look at screeds in April.)

The paver operator must judge three factors when determining

A wheeled RP-190e paver from Roadtec works on soft rural subgrades in suburban Atlanta.

Image: Tom Kuennen

paving speed, Starry says. "First, the operator must see how much hot mix asphalt is being delivered to the asphalt paver. Second, the operator must look down at the width and thickness of the asphalt pavement panel being laid. Third, he must check behind the asphalt paver to see if the compactor train is able to keep up with the paver."

This balance between production and placement needs to be maintained throughout asphalt paving. If the delivery of asphalt mix to the paver is interrupted, the asphalt paver needs to stop, he says.

"Current practice is to rapidly stop and start the paver, so the screed level doesn't fluctuate due to asphalt paving speed or head-of-material in front of the screed," Starry says. "If the paver outruns the compactor train, the entire asphalt paving operation is at risk of failing to achieve target density or smoothness."

Tracked or wheeled?

Depending on application or personal preference, the owner of an 8- to 10-foot-wide paver can select either tracked or wheeled propulsion.

Crawler tracks have a larger contact area with the ground or road base, which permits a higher tractive effort for pushing larger trucks. They have a wide application of uses, are good on difficult terrain and can pave in widths up to 50 feet with the right screed. Modern tractors control each track separately, for easy turns or movement on a radius with a constant speed.

"Track-equipped asphalt pavers offer superior traction for jobs that require wide pulls or large mix-delivery vehicles," says Caterpillar Paving Products. "High horsepower and exceptional traction keep everything smooth and consistent, helping to produce a mat without segregation or defects."

Models are available with steel tracks for dependable use and easy maintenance, or rubber tracks for improved mobility and smooth, quiet operation, Cat says.

By contrast, wheel-equipped asphalt pavers offer superior job site mobility for applications that require more paver movement and relocation. "High horsepower and excellent mobility help operators place the mat where they want it," Cat says. "Optional bogey wheel assist enhances rimpull to the front or rear bogeys [smaller wheels assemblies], or both, providing increased traction. Electronic self-diagnostics on the propel and feeder systems maximize maintenance efficiency and reduce machine downtime."

The versatility of the wheeled paver is put to the test in New England, where the winding two-lane blacktop roads can make it hard for a tracked paver to place asphalt at a swift pace. There, a Connecticut

road contractor believes an 8-foot rubber-tired paver is the top choice for best-practice paving projects on local roads.

"The rubber tires make it easy to move the paver on the roads," said Domingos Almeida, vice president, Cocchiola Paving, Oakville, Connecticut. "We can travel back and forth on the jobsite without making a mess."

In addition to the narrow, winding roads, the abundance of small intersections in semi-rural New England make the added maneuverability of his 8-foot rubber-tired Vögele Vision 5102-2 useful for the back-and-forth paving of intersections. "If you do this with tracks, they will lift the asphalt up," Almeida said.

For example, after paving one 11-foot pass to the bottom of a hill, Cocchiola's operator simply put the paver in reverse and swiftly backed up to make the next pass, driving it as if it were an automobile.

Many of the roads Cocchiola paves don't have shoulders, with pavements flanked by dirt or sand drop-offs. Almeida said that the rubber tires give the paver the higher flotation required to prevent getting bogged down in unconsolidated shoulders or rav-

Image: Tom Kuennen

Commonly used for decades, the interlocking truck hitch is falling into disfavor as best practice urges separation of paver from haul truck (via use of the MTV).

eled road edges. "In my opinion, the rubber tires are way better for maintaining traction," Almeida said.

Control of transfer

The transfer of mix to the paver gives the contractor the greatest degree of control over the ultimate quality of the mat. That's because the bumping of truck to paver, or stops and starts due to holdups in delivery, introduce discontinuities to the mat.

In the past, stops and starts and truck bumps were simply part of the process, and it was the job of the roller operator to somehow smooth things out. But today, with project profitability dependent on meeting stringent smoothness specs averaged over long distances, every element of the paving chain has to be scrutinized and subject to best practice.

For example, in decades past, a truck hitch was common on either side of the front of the paver. It clamped onto the rear wheels of the truck, holding it in place as the paver pushed the truck forward. Now, with isolation of the truck from the paver recognized as best practice, truck hitches are disappearing from the scene.

There's nothing new about most of these best practice guidelines. What's new is the necessity to follow them to win bonuses (as initial bids are cut to the bone and the bonus becomes the source of profit). Contractors also face liquidated damages penalties for failing to meet minimum smoothness requirements, which can turn any job into a nightmare. Little wonder so much attention has been given to best practice in mix delivery, transfer, and suppression of thermal and aggregate segregation at every step of the process.

Control of transfer begins at loadout in the plant, where aggregate segregation should be quelled by use of the three-drop process. It includes: a drop in the front of the truck body, one in the rear, and a final drop in the middle, with the driver moving the truck body to-and-fro. The extra effort is worth it, as it minimizes segregation in the truck body during loading and hauling.

The paver hopper receives and stores asphalt mix from a haul truck, MTV, or in the case of constrained spaces, a skid steer loader. Best practice says the mix must be delivered at a pace that ultimately provides a constant head of material in front of the screed. The hopper will always hold more mix than is needed at the time, thus the paver can continue to advance during truck exchanges. Storage is boosted with the use of a hopper insert, when fed by an MTV, or with a windrow elevator, as is the practice out west.

Undesirable segregation of aggregate within the mix takes place during the haul: The longer the haul, the more the segregation. End-of-truck material segregation – or

Image: Tom Kuennen

An operator platform with a seat that swings out to the side of the paver offers exceptional visibility to jobsite.

truck-to-truck and truckload-to-truckload segregation – can be reduced when the end dump haul truck bed is raised before opening the back gate. When the gate is finally opened, the mix is discharged from the truck bed as a mass into the paver hopper. This rapidly fills the paver hopper, and prevents the coarser particles from collecting in the paver wings.

"When unloading a truck into a paver hopper, it is important to discharge the material as a mass instead of dribbling the material into a paver," said the late J. Don Brock, former chairman of Astec Industries, in his technical paper *Segregation: Causes and Cures*.

"To do this, the bottom of the truck bed needs to be in good condition and lubricated so that the entire load will slide rearward," Brock said. "To further assure that the material is discharged en masse, elevate the truck bed to a large, but safe, angle. Rapid truck discharge floods the paver hopper and minimizes material run-around that often occurs at the tail gate. Rapid discharge prevents an accumulation of coarse material on the outside of the paver wings. Dump the truck so as to flood the hopper."

Don't empty the hopper

When the quantity in the hopper dwindles, the sides, wings, or wings of the hopper may be lifted together, or individually, to force mix on the sides down the center of the hopper and onto the conveyor below.

But, the hopper should not run low, as segregation may

occur. If the hopper empties and the wings are lifted, larger-size, cooled aggregate in the hopper may tumble onto the conveyor as a mass, making its way into the mat with thermal and aggregate segregation cooked in. If the crew must wait on trucks, it's better to slow the forward movement while keeping a minimum amount of mix in the hopper.

The operator must balance the amount of mix in the hopper with the frequency of deliveries, the feed rate (by manipulating the speed of the conveyor and augers or flow gate openings) and the forward speed of movement. Many of today's pavers will do this automatically within the set parameters.

"Do not completely empty the hopper between each truck load," Brock said. "Coarse material tends to roll to each side of the truck bed, and thus, rolls directly into the wings of the hopper. By leaving material in the hopper, the coarse material has a better chance of being mixed with finer material before being placed on the road."

Dump hopper wings only as required to level the material load in the hopper, he said, as dumping eliminates the valleys in the material bed, thereby minimizing the rolling that occurs when unloading and allowing the truck tailgate to fully swing open and flood the hopper with mix.

"Open hopper gates as wide as possible to ensure that the augers are full," Brock added. "Closing the gates and starving the augers for mix causes fine material to drop directly on the ground, causing coarser material to be augured to each side."

In addition to running the paver as continuously as possible, stopping and starting only when necessary, augers must also be run continuously, Brock said.

"Auger speed should be adjusted so that a continuous, slow flow of material occurs," he said. "Augers that run at high speeds are cycling on and off continuously, and contribute significantly to segregation at the paver. If augers are running too fast, the center of the mat will be deficient of material and will typically result in a coarse strip."

The Asphalt Institute recommends operating the paver speed and feed gates to keep the augers turning 85 percent of the time, keeping forward motion at least 75 percent of the time, and maintaining feed augers with proper head and uniform flow of material to the screed. EW