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UNIQUE PROCESS SAFEGUARDS HIGH PLAINS ROADS

Sparsely populated Lincoln County, Colorado, preserves rural road pavements with rare triple-chip seal

By Paul Fournier

Using its own crews and equipment, Lincoln County Road & Bridge Department applies first course of triple chip seal on reclaimed base.

Rural Lincoln County, Colorado, is extending the service life of its paved roads with a unique triple chip seal application that maximizes the effectiveness of its limited budget, according to the official responsible for maintaining the county's road network.

"This really works for us. It's saving us hundreds of man-hours that we used to spend patching potholes and wheel ruts," said Chris Monks, road supervisor for Districts 1 and 2 of Lincoln County's Road & Bridge Department. Monks heads a staff of 17 responsible for maintaining some 1000 miles of gravel roads and 100 miles of paved roads.

A pavement surface treatment commonly used for years by many municipal and county officials, chip seal involves applying asphalt emulsion to an existing pavement followed by a thin layer of aggregate that is embedded in the emulsion by rolling. Less common but still used to some extent is double chip seal, an application of chip seal covered with a second application using the same asphalt emulsion at a different application rate, and smaller stone.

Practically unheard of, however, is the process now being employed by Lincoln County, which uses three layers of chip seal.

Punishing Weather And Traffic

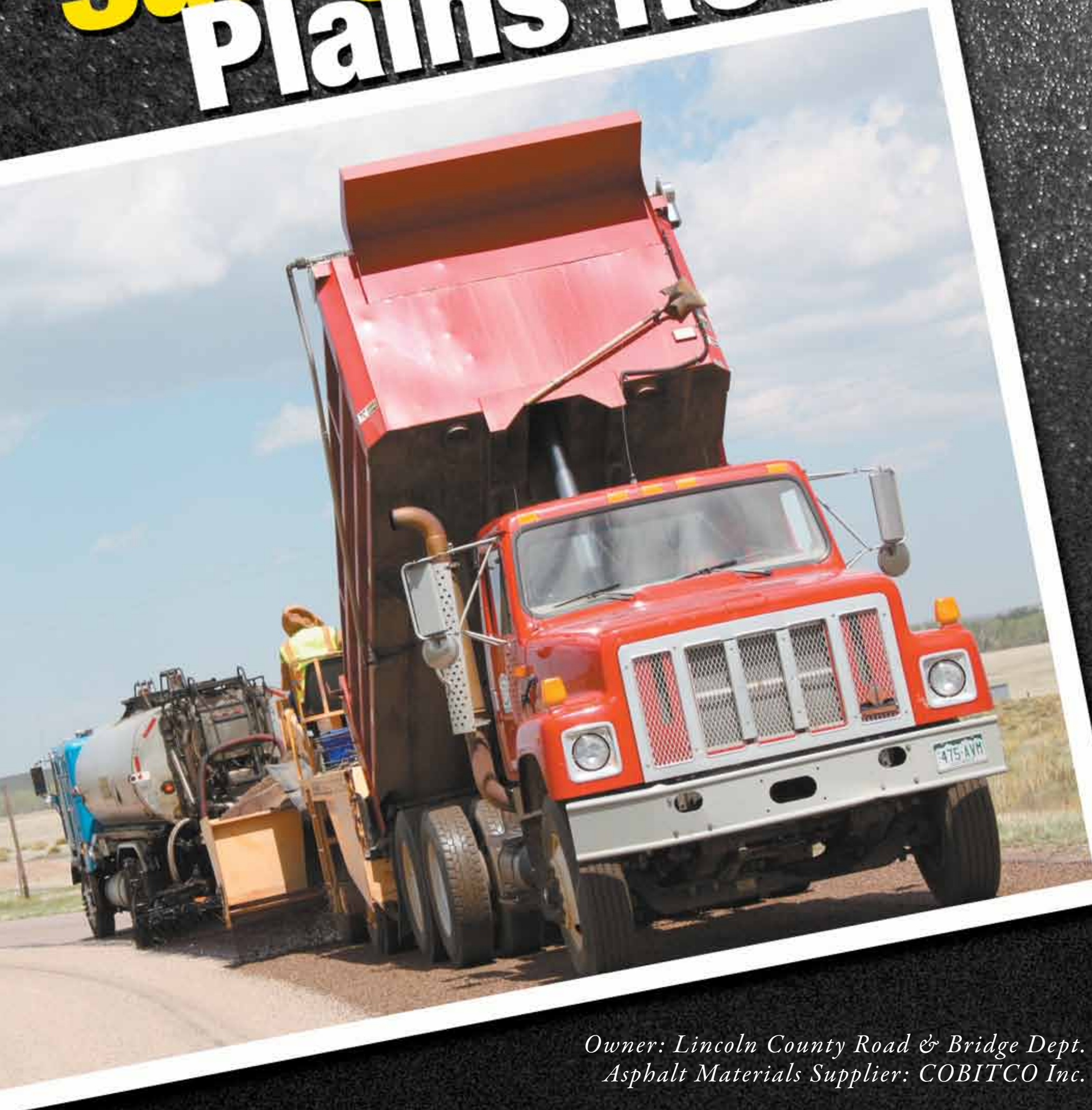
Located in eastern Colorado, Lincoln County has a harsh semi-arid climate with the wide temperature swings that characterize the 5000-feet-plus elevations of America's High Plains. Temperatures range from over 100 degrees in summer to 15 below zero in winter, with strong winds boosting the chill factor. This robust weather imposes severe demands on road pavements. Adding punishment is the heavy traffic roads carry, even though Lincoln County has one of the lowest population densities in the state -- about 2 people per square mile.

"It's not the number of vehicles but the type of vehicles that causes the problem. We have a lot of heavy farm trucks and equipment using our roads," Monks explained.

County crews periodically dress up gravel roads by adding more gravel, re-shaping the crown using a grader and stabilizing the surface with magnesium chloride. But the paved roads, which experience greater traffic volumes and faster travelling vehicles, require a different approach. What's more, the "paved" roads are not actually paved with hot mix asphalt, Monks pointed out.

"We haven't been able to afford to put down two inches of hot mix asphalt overlay on our roads for years because the price of hot mix has gone up so much," he said.

Unique Process Safeguards High Plains Roads



Owner: Lincoln County Road & Bridge Dept.
Asphalt Materials Supplier: COBITCO Inc.

"Our paved roads are really old sandy gravel roads that were built up over the years by repeatedly adding more sandy gravel and mixing it with MC-800 cutback asphalt. In some places we have almost ten inches of this type of mix-in-place pavement.

"About 15 years ago, we started having more and more pavement failures as wheel loads increased. We were constantly patching the road." By 2001 they were spending so many man-hours patching they had to find an alternative.

An Alternative To HMA

Monks wanted to try chip seal as a wearing surface but he knew he needed to have a stable base under it. Classified by the Federal Highway Administration (FHWA) as a pavement preservation technique, chip seal retards cracks from reflecting through to the surface, prevents water intrusion into the base and sub-grade, and provides a skid-resistant surface. But since it is a non-structural surface method, chip seal needs an underlying structurally stable base for it to work as designed. Monks realized the existing pavement would not provide a stable base if left as is. But if they took advantage of the significant amount of asphalt already present in the built-up pavements through reclamation, they could create the stabilized road base they needed.

As defined by the FHWA, full depth reclamation is a recycling method whereby all of the asphalt pavement section and a predetermined amount of underlying materials are treated to produce a stabilized base course. Different types of additives may be added to improve the base. The process entails pulverizing existing pavement, introducing additive, shaping and compacting the mixed material, and applying a surface or wearing course. This is usually performed to depths between 4 and 12 inches.

In order to save money on the reclamation effort, Monks rented a 350-hp CAT RM-300 Rotary Mixer reclamation machine from Denver dealer Wagner Equipment, and used County forces to operate it, including himself. The reclamation machine depth was set to penetrate the entire asphalt-containing layer plus several inches of underlying gravel. They operated their own CAT grader to shape the reclaimed base, while magnesium chloride was added to improve stability.

For the chip seal overlays, the County employed its own Flaherty mechanical chip spreader and seven ton HYSTER pneumatic roller. They contracted with COBITCO Inc. to supply and also spray apply the asphalt emulsion, while the County's dump trucks hauled the stone chips from Denver to the County road.

That first reclamation and chip seal project was so successful that it became the template for an annual paving program.

The Triple Chip Seal Program

Each year around the beginning of May, the County rents the CAT RM-300 reclamation machine from Wagner Equipment and pulverizes a predetermined section of road. EnviroTech Services of Greeley, Colorado, sprays the reclaimed road base with Roadsaver, a magnesium chloride compound used as a road stabilization agent. Applied at the rate of 0.5 gallons per square yard, the compound binds fine dust and aggregate and helps to keep surfaces stable and dust free.

A BearCat distributor on a Freightliner chassis sprays COBITCO's CRS-2R emulsion modified with BASF SBR latex polymer at 0.65 gallons per square yard

Left: One of County's International trucks feeds hopper of chip spreader with ¾-inch stone hauled from a supplier in Denver.

Next, Monks' crew installs a single layer of chip seal. The first step is the application of COBITCO's CRS-2R asphalt emulsion, which is modified with styrene-butadiene-rubber (SBR) latex polymer supplied by BASF Corporation. BASF personnel, Arlis Kadrmas, asphalt technical group leader, and Bill Kirk, laboratory associate work with COBITCO personnel to formulate asphalt emulsion products for the region. In commenting on this cooperative effort, Steven Marshall, COBITCO regional sales representative, noted that the company is a strong advocate of techniques like chip seal, micro surfacing and slurry seal and is an active member of the Asphalt Emulsion Manufacturers Association and an associate member of the Colorado Asphalt Paving Association.

In addition to supplying CRS-2R, COBITCO rents the County a 4000-gallon BearCat liquid asphalt distributor with an operator to apply the rapid-setting emulsion on the road base. The BearCat applies emulsion at the rate of 0.65 gallons per square yard for the first stone application.

County's Flaherty chip spreader broadcasts ¾-inch stone at rate between 30 and 35 pounds per square yard for first course.

Chris Monks, left, road supervisor of Lincoln County Road & Bridge Dept. Districts 1 and 2, and Steven Marshall, COBITCO Inc. sales representative, check job progress.

A Half-Century Making Emulsions

A family-owned and operated company, COBITCO and its predecessor have been making asphalt emulsions since the late Edward Morgan established Colorado Bitumuls Co. Inc. in Denver in 1960. At the time, the company was a licensee of Chevron Asphalt to produce emulsions but in 1982 when Chevron stopped its licensing program, Morgan established his independent company, changing the name. His sons, Lee Morgan, president, and Robert Morgan, vice president, have expanded its territory to include portions of Wyoming, Kansas and Nebraska, and broadened its product line to include conventional emulsions, polymer-modified emulsions containing SBS or SBR modifiers, and other pavement preservation products.

County-owned HYSTER pneumatic roller embeds aggregate into asphalt emulsion.

A County-owned Mack truck deposits stone from Denver supplier into Flaherty chip spreader hopper.

Lincoln County trucks feed the Flaherty chip spreader with the aggregate – a ¾-inch stone they broadcast at the rate of 30 to 35 pounds per square yard. The County buys the stone in the Denver area from various suppliers and hauls it to job sites.

"It's a long haul, over 180 miles round trip, but that's the nearest good-quality stone we can find," said Monks. "There's hardly any stone in Lincoln County – what we have here is mostly sandy gravel."

The crew then waits 30 days before they apply the second chip seal application. For this layer, they have the CRS-2R emulsion sprayed at the rate of 0.55 gallons per square yard, and broadcast a smaller, ½-inch stone on the road at the rate of 26 to 30 pounds per square yard.

Then they wait an entire year, and apply the third course of the triple chip seal. The emulsion application rate is between 0.45 and 0.50 gallons per square yard, and stone size is ½ inch.

Saving Man-Hours While MakingProgress

While the cost of triple chip seal is higher than that of a single or double chip seal, Monks noted, it's much more effective, and it is less expensive than installing hot mix asphalt over the same number of square yards of road. Due to the size of the County budget, they are limited to applying the process to just 0.6 – to 1.0 miles each year. Monks admits it's a small, incremental effort, but eventually he hopes to have all of his paved roads treated this way.

"We don't have to return to the same section of road and patch it up every year. In fact, we still haven't had to go back to the first road section we did nine years ago.

"Overall, this process is saving us hundreds of man-hours, and of course, money," he concluded.