Asphalt pavement placed on EMC SQUARED Stabilized soil subgrade

Photo: Stabilization Products LLC

Canadian Success Story
Four Times the Bang for the Loonie*

***Note for U.S. readers — In Canada the Canadian Dollar is also called a Loonie, which is the equivalent of calling the U.S. Dollar a Buck**

With over 400 kilometers of a rural road system being heavily impacted by fleets of trucks servicing oil and gas production wells, a public agency in the Province of Saskatchewan set a high bar for responsible use of public funds. While the Rural Municipality of Wilton (RM of Wilton #472) is blessed with the economic benefits of having over 6,000 producing oil and gas wells in their jurisdiction, which is more than four times the number of people living in the area, they were cursed with the excessively high costs to maintain these roads for reliable all-weather access to the oil and gas wells by the fleets of service trucks. For some added perspective from another public agency that has experience in regard to the impact of oil and gas development on road systems, the State of Texas reports that the volume of truck traffic required to bring a single gas well into production is equivalent to the loading of approximately eight million cars. Truck traffic required to maintain a single gas well's production is equivalent to up to an additional two million cars per year.

The Rural Municipality (RM) decided to make an investment in permanent improvements rather than spending available funds on daily grading maintenance for their unpaved roads and constant repair and reconstruction of their paved road system. The RM chose an innovative approach to upgrade approximately 160 kilometers, or 100 miles, of their primary road system. Saskatchewan is one of four Canadian Provinces that have Rural Municipalities, which are basically an alternative to county governments, but with smaller amounts of territory typically under their jurisdiction. Starting with a commitment from their elected leader and their administration to make the best possible use of the funds the RM was receiving during the years of peak petroleum production in the local area, they were free to look beyond the strict, self-imposed limitations enforced by federal, state and provincial transportation agencies that typically control the purse strings and limit use of more innovative technologies. The RM of Wilton is headquartered in the Town of Marshall, located southeast of the City of Lloydminster in west-central Saskatchewan. Lloydminster is unique in being a city with a single municipal administration that straddles the border between two Canadian Provinces, which in this case are Saskatchewan and Alberta.

The mission of the RM of Wilton management team included identifying and procuring the best available road construction equipment and road stabilization products in the world market. They had started their road improvement program using bulk cement and fly ash products to harden their local soil materials as a money-saving alternative to building roads based upon conventional design methods that rely on

importing millions of tons of crushed aggregate materials. Even though the RM had developed their own facility for producing high-quality crushed aggregate materials, they were conscious of the ever-increasing costs for trucking aggregate materials to distant locations, particularly since the heavy truck traffic on their road system necessitated placement of thick layers of crushed aggregate to bridge soft subgrade conditions.

The RM was soon researching alternatives to cement and fly ash because these calcium-based products were costly to purchase and the roads where they had been applied were still subject to failure during the periods of severe freezing weather. The Province of Saskatchewan, located in the center of the continent far from any moderating oceanic influences, is one of the coldest regions in Canada. The maximum daytime temperatures remain well below Zero for extended periods during the winter season. This region receives frequent rainfall events during the summer and water is still able to saturate soils treated with cement and fly ash products. It is the presence of that water within the road structure that exacerbates the damage to roads in cold regions during the times of the year that the weather cycles between freezing and thawing temperatures. When saturated base course and subgrade layers previously treated with cement and fly ash fail during severe freezing temperatures, the cracking damage that occurs within these layers then reflects upwards and severely cracks the asphalt pavements placed above. This costly pavement failure mechanism is known as reflective cracking.

Taking the construction of the road improvement projects into their own hands, the RM purchased two German-made Wirtgen machines capable of milling distressed asphalt pavements as well as deep mixing cement and fly ash stabilization additives with the subgrade soils. Researching more effective alternatives to cement and fly ash, they reviewed the engineering data and case histories available online for a concentrated liquid stabilizer product manufactured in the United States. The EMC SQUARED Stabilizer treatment is less than one-fourth the cost of the cement products and much faster to apply and cure so that traffic can be quickly restored. These factors also make the EMC SQUARED Stabilizer less expensive to apply. Even better, the EMC SQUARED Stabilizer is proven effective in keeping water out of base course and subgrade materials, eliminating the freeze-thaw damage that they had been experiencing with cement and fly ash treated soils.

The RM management had very ambitious goals to upgrade the greatest possible length of road with available funds. A project that caught their attention was designed by the U.S. Army Corps of Engineers and located at Fort Bliss, a huge U.S. Army Base that stretches across the border between the States of New Mexico and Texas. This training base for military tactical equipment has hundreds of miles of unpaved roads accessing remote training ranges. The designers for this project had also been interested in improving the greatest length of roads possible with the $60 million construction budget they had available. They presented contractors with two bid options. The conventional design was based upon installing two layers of crushed aggregate base course (ABC) materials totaling more than 400 mm (sixteen inches) in thickness, which would have limited the amount of road that could be improved to approximately

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Wirtgen mixer connected to tanker of EMC SQUARED Stabilizer solution

113 kilometers (70 miles) in length. The alternative design option used the EMC SQUARED Stabilizer to strengthen a layer of locally available soils in place of eight inches of ABC material, in combination with using the stabilizer product to armor eight inches of ABC material as a running surface for heavy equipment transporter trucks weighing over 120 tons loaded and caravans of Abrams M1A2 military battle tanks. The alternative design based upon use of the EMC SQUARED Stabilizer stretched the available budget to eventually construct over 187 kilometers (116 miles) of these stabilized heavy haul roads with the same construction budget. The RM reviewers were able to see the results of the materials testing associated with this project that were made available, including tests conducted with Dynamic Modulus and Repeated Load Triaxial (RLT) laboratory apparatus, and Falling Weight Deflectometer (FWD) equipment.

Full Fort Bliss Case Study here: **https://stabilizationproducts.net/docs/18676.pdf**

Carefully implementing the use of their new equipment and then the advanced stabilizer technology one step at a time, the RM road maintenance crew first stabilized a one-kilometer section of road with an EMC SQUARED Stabilizer treatment. They observed that the stabilized length of road remained rock solid under heavy truck traffic during a rainfall event while their other unpaved roads deeply rutted and turned into mush under the same level of truck traffic. By switching from cement and fly ash to the EMC SQUARED Stabilizer, the major cost savings of this one-kilometer test convinced the RM to ramp up the scale of their road improvement program during the following summers.

As part of their campaign to permanently upgrade their primary road system, the RM was at the same time importing large quantities of soil borrow material to further elevate the road structural section above the surrounding ground. The undulating local terrain is a challenge for road construction because of the presence of sloughs and swampy areas intersecting the road alignments, and groundwater at shallow elevations in other areas. The available soil borrow material contained a large amount of oversize rock and cobble that frequently damaged the Wirtgen equipment used for mixing in stabilizer products. The RM solved this problem by purchasing two rock crusher/soil stabilizer attachments from FAE, an Italian equipment manufacturer. Mounted on two large 4WD agricultural tractors, the FAE equipment allowed the road stabilization crew to crush the oversize rock and cobble at the same time as mixing in the soil stabilization treatment.

As the EMC SQUARED Stabilizer continued to prove effective in solidifying and armoring the soil materials against water infiltration and damage during freeze-thaw cycles, the RM adapted their equipment train to apply the EMC SQUARED liquid stabilizer solution as efficiently as possible. They started by equipping their 35,000-liter (9,250 gallon) water tanker trucks to connect to the onboard metering systems of the mixers so that the stabilizer solution could be sprayed directly into the soil materials being processed in the mixing chambers. The water tankers were further modified with a customized quick-connect system for transferring the liquid stabilizer product from the 1,000-liter IBC shipping containers into the water tank. With average road widths ranging from 10 to 11 meters (32 to 36 feet) that they typically stabilize to a depth of 300 millimeters (12 inches), the RM was faced with a considerable volume of earth material that would need to be processed with the stabilizer treatment on a daily basis in order meet their goal to stabilize a large number of roads during their very short and often rainy summer construction season. The RM's road maintenance crews completed more than 75 kilometers (45 miles) of road stabilization in a single summer. In these periods of peak production they added large 4WD tractors equipped with construction discs to the equipment train to provide additional mixing capacity in support of the Wirtgen and FAE mixers. The tractor-drawn discs provided the crew with the ability to mechanically aerate excessively wet subgrade soils that sometimes needed to be dried back in preparation for the road stabilization operations. Three motor graders provided extra mixing horsepower and the shaping and fine grading for the surface of the stabilized layers. The motor graders were equipped with ripper teeth which were used to break up the existing road surfacing materials prior to the arrival of the mixing equipment and the rest of the equipment train assembled for application of the EMC SQUARED Stabilizer treatment. Since the Wirtgen and FAE mixers were equipped with spray nozzles to apply the stabilizer treatment during the mixing process, ripping the layer to be treated ahead of the arrival of the mixing equipment allowed the mixers to maintain a consistent forward speed and stabilizer application rate regardless of changing soil conditions as they progressed down the road.

Photos and videos courtesy Jon Guiffre
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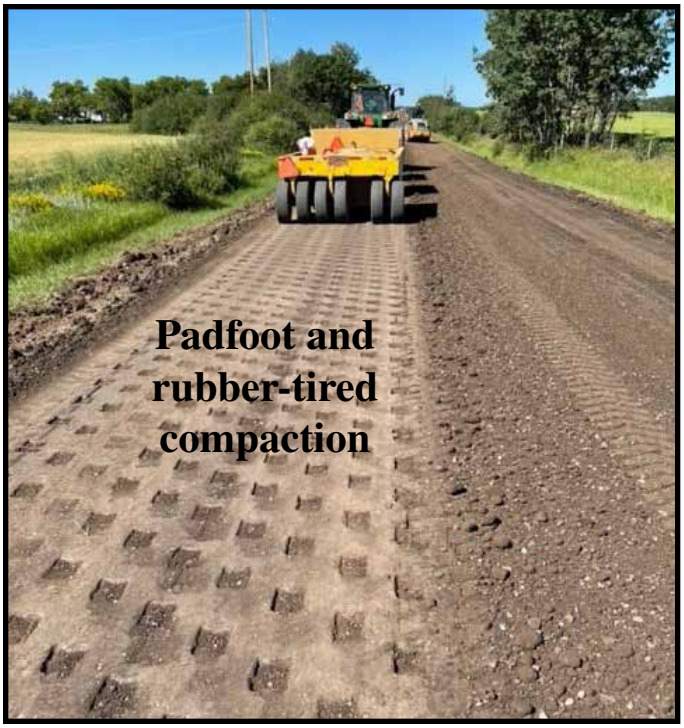
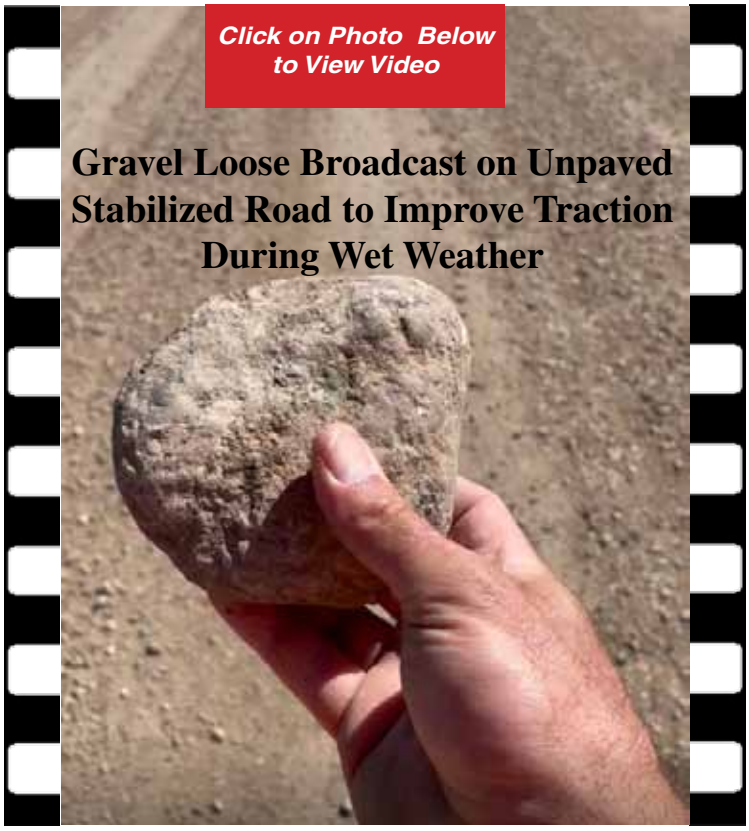
Compaction of the treated soil was handled with a combination of vibratory rollers and tractors pulling tow-behind pneumatic rollers and Impactor-type compactors. Arrangements with the local oil and gas operators limit the length of time that service trucks can be restricted from accessing roads during road construction and maintenance operations, so truck traffic was often allowed to continue through sections of road that were either undergoing applications of the EMC SQUARED Stabilizer or during the early curing stages of the stabilizer treatment. Since cement and fly ash treatments are subject to damage for a period of days following their application and require extended periods of full traffic restriction, the RM's switch over from calcium-based stabilizers to the quicker curing EMC SQUARED Stabilizer product was a great convenience and simplified their planning and scheduling work.

Over the course of six summers of road stabilization projects, the RM's road maintenance crews operating this impressive equipment train were responsible for the construction of over 160 kilometers (100 miles) of stabilized roads. Over half of these roads have now been surfaced with hot mix asphalt or bituminous surface treatments (chip seals), while the rest are utilized as all-weather stabilized roads with gravel traction surfaces. These unpaved roads are reported to perform well with only limited dust emissions and maintenance requirements. These roads are often stage one in the RM's staged road construction projects that stabilize subgrade and apply a gravel traction surface the first summer and then place the asphalt pavement or bituminous surface treatment the following summer after no more preparation than sweeping the surface of the stabilized layer with power broom equipment. Some roads are stabilized and covered with the asphalt pavement or bituminous surface treatment during the same summer. In these cases the surface courses are placed directly on top of the stabilized soils without application of the gravel traction course. The RM's road program now uses cement and fly ash products infrequently, primarily in areas where soil drying agents are needed to build sections of road through flooded sloughs and swampy areas, or through deposits of uniquely problematic local soils. In all other situations, the EMC SQUARED Stabilizer product has become their clear preference for road construction projects.

With various sources reporting that the fossil fuel-intensive cement manufacturing process is responsible for producing approximately 8 percent of the world's Greenhouse Gas (GHG) Emissions, saving cement products for their higher value applications, i.e., concrete, by selection of this more appropriate stabilizer product technology also reduces the overall environmental impacts associated with road construction.

While the RM of Wilton selected this clean green technology to upgrade the performance of a major portion of their road system, they also saved approximately $120,000.00 per kilometer, or $200,000.00 per mile, in comparison to their previous use of cement and fly ash products. With over 160 kilometers (100 miles) of stabilized road now completed, by using the EMC SQUARED Stabilizer the RM has realized cost savings that are nothing to sneeze at, regardless of whether your version of a dollar happens to be called a Buck, or a Loonie.





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The cost-savings and performance advantages of the EMC SQUARED System are contingent upon thorough preliminary engineering reviews, competent designs and specifications, and proper installation. Contact us for assistance on your next design or construction project.

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