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October 2021 Edition Reprint of Lithified Technologies US - LithTec™ Featured Magazine Article

Preservation Techniques Improve the Strength of Roadways

New resources are available to contractors that can help the base we're building our roads on last longer.

September 28, 2021 | by Jessica Lombardo

Drone Photo: Aeron Goldheart

We all know that our roads will only be as strong as the bases they are built on; "Roads may wear from the top, but they fail from the bottom."

While we invest plenty of time and resources creating more resilient asphalt mixtures to help prevent wear from the top, we haven't focused too much on creating a stronger foundation for our roadways.

If left untreated, cracks in asphalt lead to deterioration of the base structure beneath our roadways.

Lithified Technologies US developed a soil technology known as LithTec™ that mimics lithification, a natural process that transforms soil into stone over thousands of years. The technology developed uses the same naturally occurring minerals and chemicals, along with accelerators, to make lithification occur in 24-48 hours. This "accelerated lithification" provides optimal strength for road infrastructure, enabling thoroughfares and highways to last much longer.

"LithTec™ is all about building from the bottom up," Bob Sherwin, CEO at Lithified Technologies US says "LithTec™ turns the road base or subgrade into a rock-hard and water-resistant road foundation that remains bound and non-dispersive while under water. You would witness this with the two soil samples (one treated with LithTec™ and one untreated) submerged under water at the same time. The untreated proctor immediately will start disintegrating turning the water muddy and the cylinder will lose approximately half of its original size in a very

short time. The LithTec™ treated sample will remain rock-hard and non-dispersive as no material will fall off and the water will remain clear."

Keeping water out of the road base is a key objective and this technology aims to help with that.

Full Depth Lithification

We have all heard of Full-Depth Reclamation (FDR), which is the process of pulverizing all layers of existing asphalt pavements in place to depths of up to 20 inches. FDR has grown in popularity as equipment has evolved and recycling efforts have heightened. While the process is efficient in creating a structurally sound roadway at a fraction of the cost of remove and replace, it does not strengthen the existing roadbed.

Added stability can be achieved if the reclaimed base layer is chemically or mechanically stabilized. Chemical stabilization introduces cement, lime, kiln dust, or emulsified asphalt to improve binding of the materials.

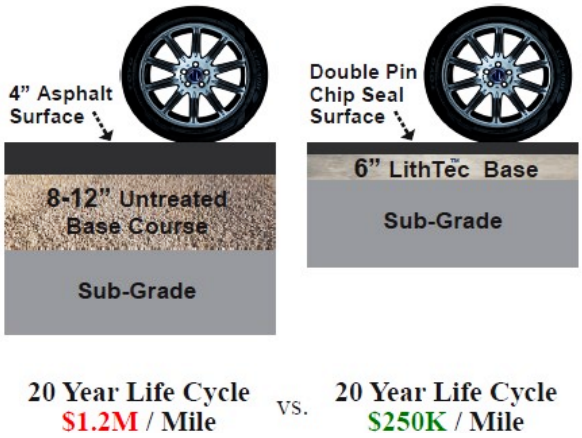
As states and municipalities are continually trying to make their road investments last longer, Lithified Technologies US has taken this process a step further using science to actually strengthen the roadbed for good.

LithTec™ produces both high strength and high ductility simultaneously. These qualities are all achieved through the “Accelerated Lithification” process, which decreases the porosity, increases the binding potential, is resistant to abrasion and ultimately turns soil into stone through a process they call Full Depth Lithification (FDL). This process can save 30-50% over traditional FDR projects.

"Accelerated Lithification Technology is not considered to be a “soil stabilizer” at all, as the word itself implies that the product is trying to 'stabilize the soil’.” Sherwin says. "LithTec™ technology is not gluing the dirt together like a polymer or making it sticky like a lignin, molasses or tree sap which is simply a compaction aid, that washes out under rain and snow conditions. Instead, the LithTec™ process transforms the soil or road base material at the molecular level, turning it into a rock-hard water-resistant base with unprecedented load bearing capacity. This is the first product to achieve double the strength of cement and 3-4 times the ductility. The company spent over $15M and nine years in development to be able to prove this."

Sherwin's company developed the dry blend of naturally occurring minerals that they now call LithTec™. These materials firm up within a day after being mixed with and compacted into traditional road base materials at optimum moisture content. The company refers to its LithTec™ product as 'Nature's Concrete™.' "LithTec™ transforms traditional untreated base course that averages 25,000 PSI Modulus into a "high-performance" road base that has 500,000 PSI Modulus," Sherwin says. "By increasing the road’s load bearing capacity by over 2,000%, road designers and engineers can transfer the “structural credits” (the strength and load bearing capacity) normally found in the asphalt surface, into the LithTec™ treated base."

As a result, the asphalt thickness may be reduced by as much as 67%."Counties across the country have discovered that a LithTec™ treated road base with a chip seal surface will provide an asphalt performance road for approximately 25 cents on the dollar, compared to a traditional asphalt road," Sherwin says. "When you put the chip seal over the top of LithTec™, it's the equivalent of putting it on top of asphalt, but in a much stronger and more economical way."



Custom Formula Provides Lasting Results

Due to the high volume of materials in road construction, Lithified Technologies knows that optimization is the key to the success of each project.

To maximize the high-performance potential of your roads, Lithified Technologies provides a "Value Engineer" package that includes customization of the LithTec™ product to meet the specific project needs. A trained "GeoTechnical" field operator is sent to each project to sample the project and determine variations so that the product can be customized based on the specific variables present in the road base. Testing in the lab and again in the field is performed to ensure optimal results will be achieved.

"From the very beginning of the process, our engineers will go out and pull soil samples from the project," Sherwin says. "They will do GPS mapping of where the samples came from and bring them back to the lab where our technicians will perform a battery of 10 different tests on those samples. This is all a part of the customization process to determine which formula we need to get the optimal performance out of that material."

When it's time for installation of the product, each custom formula is blended on-demand for each specific project. The blend the materials at one of their 19 locations across the country and ship it out the day before or the day of the project. The GeoTechs will again be on-site to perform quality control as well.

"The field testing will make sure the material is hitting the same numbers in the field as we achieved in the lab," Sherwin says. "They make sure you're hitting your optimum moisture content, ensuring the proper depth is being met, the proper dosage is going down and compaction is being met. This is all included with the purchase of the LithTec™ product."

The LithTec™ product is applied on-site after a reclaimer/stabilizer comes in to grind up the failing roadway. The LithTec™ powder is laid down per the custom formula. The reclaimer then goes back through the material ensuring the material is at the pre-determined optimum moisture content. Compaction then occurs with a sheeps foot roller, a grader then shapes the road and a flat wheel roller finishes out the compaction before the surface is put down.

Perpetual Roadways & Infrastructure Preservation

When you look at the challenges of the road building industry today, we are facing much higher amounts of traffic in much heavier loads as the shipping of goods has never been higher. These increased loads are taking their toll on our roads and highways and the industry must figure out how to build roadways that sustain these volumes.

"We have 15 million 40-ton trucks on our highways and that number is growing by the day," Sherwin says. "DOT studies have said that each 40-ton truck has as much wear and tear on an asphalt highway as 10,000 automobiles."

Building stronger foundations can be a key to longer-lasting roadways.

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LithTec™

The Solution to Americas Failing Roadways at a Fraction of the Cost

High Performance with LithTec™

Optimization

There are countless soil types and base materials found in roads that range from blow sand, a zero PI (plasticity index), to expansive clays that can exceed 50 PI. Each soil type presents its own unique challenges requiring different mineral combinations and ingredients necessary to provide the solutions to these challenges. Lithified Technologies US LithTec™ is the ***first and only*** company to produce a **Fully Customizable Product** that is engineered specifically for each project, to achieve *Optimum Performance* in any given soil classification. Until now DOTs, road builders and engineers have relied on two options, lime or cement and both have limitations and downsides that do not exist in LithTec™ applications.

Value Engineered Roads with LithTec™

Get More Mileage out of your Budget

A common problem of every City, County, State DOT and private company responsible for road maintenance is that there are more roads to maintain than budget to address the issues. Everyone is looking for high quality, long lasting roads for the least amount of money possible. Lithified Technologies US understands the problems and is delivering the **"Total Road Solution"**, to long lasting, high performance roads, with extreme load bearing capacity, water resistance and quality control built into the foundation of every **LithTec™ Road** at a fraction of the price of traditional roads with ***Value Engineering***.

Covering the Spectrum with LithTec™

Products with Services from A to Z

LithTec™ High Performance Optimization Products cover the spectrum of soil challenges AND our Geo-Technical Services ensure quality control during each step of the project, including Soil Sampling with GPS mapping, an Extensive Battery of Lab Testing for every project, which results in a Custom Formulation for your road. LithTec™ on-demand Regional Blending Facilities manufactures and ships the Product to the job site where any County road crew or road contractor can install the LithTec™ product. Our Geo-Techs are there to provide Quality Control, Training when necessary, on-site Field Testing, Installation Coordination, seeing that proper dosage has been applied at optimum moisture content and blended properly into the base. Once the compaction numbers are achieved and the Product begins to cure, their non-nuclear densometers and light weight deflectometers test for stiffness, density and compaction, **Ensuring that *Optimum Performance*** has been built into every LithTec™ road.

Raising the Bar

Lithified Technologies US has raised the bar through their revolutionary ***Accelerated Lithification Soil Technology, High Performance Optimization, Full Spectrum Geo-Technical Services and Value Engineering which can save up to 80%,*** all of which provide the components necessary to have a successful road project every time and at a fraction of the costs of traditional road construction methods.

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LithTec™ Value Engineering

START HERE!

BUILDING LONGER LASTING HIGH-PERFORMANCE ROADS THAT COST LESS TO CONSTRUCT

Highway and Road Engineering Designs can save 33% to 50% over a traditional road project through *Value Engineering*.

For example, the Resilient Modulus of untreated base course is an average of 25,000 psi (M_R) and as a result, has a limit or cap on the Structural Number that is allowed in the design of a road. Lithified Technologies US has developed an *Advanced Lithification Soil Technology* that turns road base material into a rock-hard, water resistant base that can match or exceed the strength of asphalt. As a result, the structural credits (typically achieved in the thickness of the asphalt) can be transferred into the base layer at a fraction of the cost.

A LithTec™ treated base can achieve the same structural coefficient as asphalt, which is .4 to .45 and the same Resilient Modulus of asphalt, which is 500,000 psi (M_R). Achieving these numbers in the base layer suggests that every inch of LithTec™ treated base is equivalent to an inch of a semi-rigid pavement. As a result, a pavement design of 4" or 6" of asphalt surface could be reduced to 2" or 3" resulting in a savings of 50% to 67% of the cost of the asphalt.

The Asphalt surface can cost as much 2/3rds of the total road construction project. Employing *Value Engineering* as described above can provide 33% to 50% savings to the overall project.

• THE LITHTEC™ ALTERNATIVE

LithTec™ provides an alternative for Counties and State roads, the ability to apply a double pin chip seal surface on top of a LithTec™ treated base, which is the equivalent of chip seal on top of asphalt. This combination offers an all-weather, long lasting, high-performance chip seal road for as much as 75% savings over a traditional asphalt road, thus yielding more miles for your budget.

• GEOTECHNICAL SAMPLING

Lithified Technologies US trained Geotechnical Field Operators will travel to your road, sample appropriate cross sections, determine material variations, sample pits if required, and make observations regarding road history & drainage.

• PRODUCT CUSTOMIZATION

95%-98% of the finished product of your road base will be made up of your previously purchased on-site materials. Lithified Technologies US utilizes your on-site materials to customize a LithTec™ blend to maximize performance and road life.

• SOIL TESTING

Lithified Technologies US Geotechnical Lab completes extensive testing batteries on each roadway sample that include: **Gradation/Sieve Analysis, Moisture Content, Plasticity Index (Pi), Proctor, California Bearing Ratio (CBR)/ Shrink Swell, Resilient Modulus Derivative (Mr), Unconfined Compression (UCS), Submerged Unconfined Compression and Capillary Unconfined Compression.**

• ON-SITE PERFORMANCE TESTING

Lithified Technologies US Geotechnical Field Operators will support the installation of your customized LithTec™ blend with correlative Lightweight Deflectometer Testing that ensures that the testing you were provided in the lab is matching the results being achieved in the field. Operators will also measure moisture and depth of grind to quality control the most significant aspects of the installation process.

LithTec™ Treated Base Under Chip Seal Haul Road in Modesto, CA

Water and weight loads are the top two reasons that roads fail. Cement Treated Base (CBT) is extremely brittle and causes reflective cracking during the shrinking process. This is why the Portland Cement Association requires microfracturing, which compromises the strength of the base and creates openings for water to get into, which further undermines road foundations.

LithTec™ on the other hand can match the strength of CTB at half the dosage and has much higher ductility to prevent reflective cracking. As a result, microfracturing is not recommended with LithTec™. LithTec™ also has a 6 to 8 hour delay set time which enables you to open up larger sections of road and get a higher production rate per day, thus saving additional costs in equipment and labor. You use half the amount of product, half the amount of water and can complete the road twice as fast which means with less traffic disruption, mobilization is optimized.

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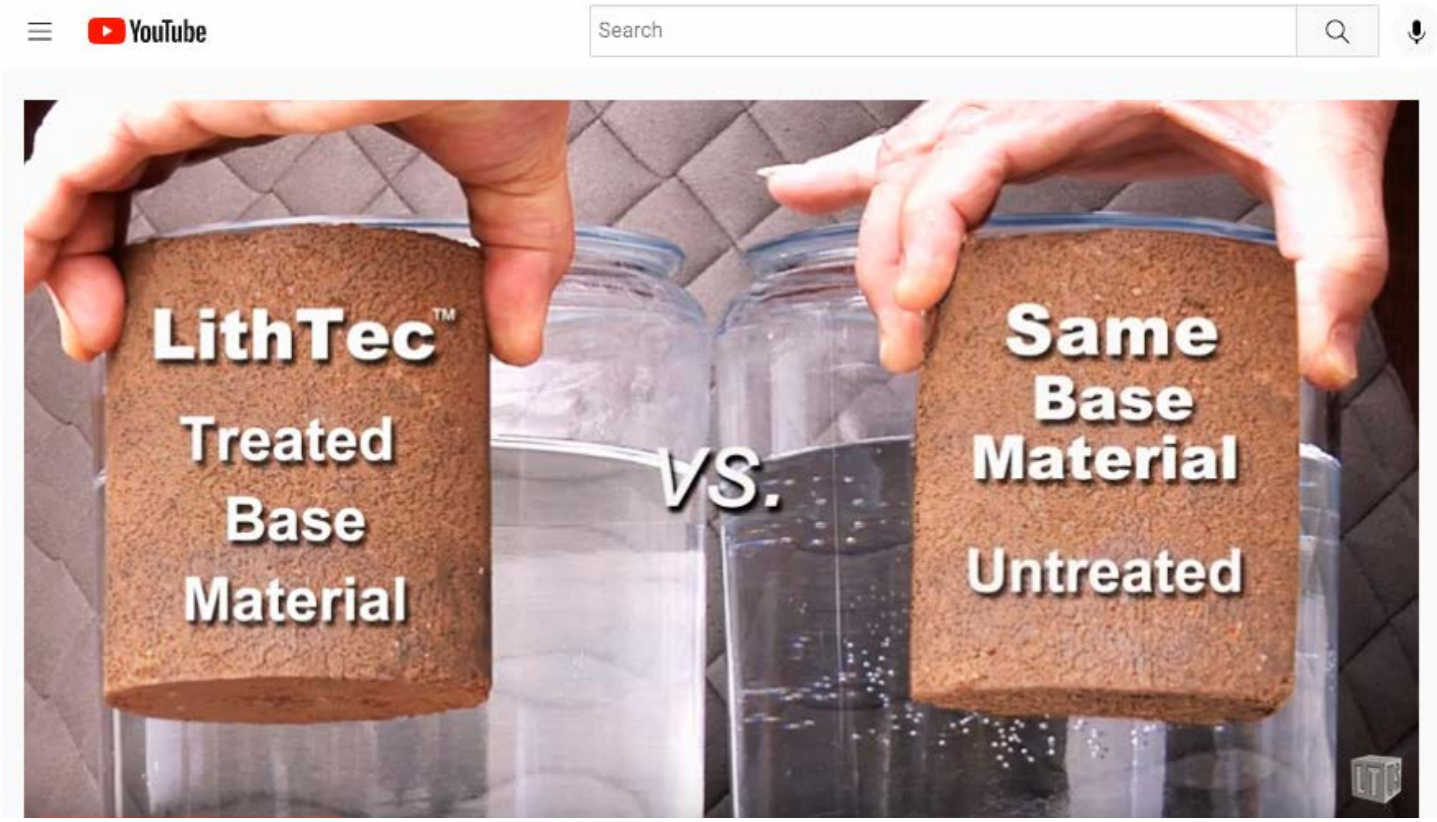
This short video illustrates what happens to a traditional untreated road base material puck vs LithTec™ treated when placed in flood-like conditions.
Which foundation would you prefer under your roads? The distinction is amazing.

https://youtu.be/2DQh9XOKIXM



The untreated material melts down in seconds as shown in 75 seconds