Renolith 2.0 Product Data Sheet

Overview

Stabilisation is the improvement of a soil or pavement material usually through the addition of a binder. In-situ recycling of pavement material via stabilisation with cementitious binders is a highly sustainable and cost-effective approach to the construction of road pavement base layers.

Renolith 2.0 is a unique, patented, non-hazardous nanopolymer admixture for cementitious binders. Chemically, it is a colloidal suspension comprising a latex emulsion and stable colloidal dispersion of nanosilica and nanocellulose. Its super-pozzolanic behaviour significantly improves the engineering properties of cementitiously bound materials and reduces the risk of shrinkage cracking. It enables a resilient pavement base layer to be constructed from any inorganic soil or recycled material. Pavements may be designed and constructed using standard stabilisation (cold recycling) or plant mix methods.

Refer to https://renolith.com.au/resources for safety information and further guidance.

Case Studies

Renolith[1] nanotechnology has been proven in more than 70,000,000m^2 of pothole-free roads around the world. Selected case studies are summarised below. In all cases the pavement was constructed as a single base layer of Renolith-enhanced cementitiously bound material with no subgrade remediation.

Project name	Application	Location	Stabilised material(s)	Wearing course	Links
Sydney 2000 Olympics	Heavy/light roads, carparks, paths	NSW Australia	High plasticity clay	Spray seal	Summary Testimonial
Wonglepong Rd	Unsealed road (Trial)	QLD Australia	Sandy lateric, Sandy clay (orange), Black clay (high PI), Sandy clay + gravel	None (unsealed)	Summary Trial Report
Ekkamai-Ram Inthra Bicycle Track	Cycleway	Bangkok Thailand	Silty sand	30mm asphalt	Summary
Ratchadamnoen Klang Road	Busy urban road	Bangkok Thailand	Crushed rock (plant mixed)	50mm asphalt	Summary
Brenner Autobahn	Freeway	Italy-Austria	Outworn granular + gravel supplement	~100mm asphalt	Summary Case Study Project Report Video
MADI Trials	Road base (Trials)	Russia	Sand (plant mixed)	None (out of scope)	Summary
Kola motorway	Highway	Russia	Medium sand (plant mixed)	50mm asphalt	Summary

[1] 'Renolith' is the original formula admixture, also previously marketed as 'Nano Terra Soil' (NTS) in Europe. 'Renolith 2.0' is a double concentrate of Renolith/NTS.

Patents

Patent WO1997023433A3, Dispersions and the use thereof in concrete mixtures
Relates to: Renolith (original formula)

Invention: An aqueous dispersion containing a latex, an alkaline earth metal formiate, cellulose ether and lauryl sulphonate can be added to a concrete mixture as an auxiliary agent to make the concrete more flexible and reduce shrinkage during setting. Adding the dispersion to concrete mixtures allows also addition of fillers hitherto regarded as toxic to cement.

Patent WO2010018020A1, Dispersion for use in a concrete mix
Relates to: Renolith 2.0 (Double concentrate)

The object of the invention is to further develop a harmless to the environment concrete mix, which has a reduced shrinkage during curing, increased flexibility of the final product after curing and has a higher long-term stability.

The concrete mixture according to the invention can be used for any type of concrete construction, preferably for road construction.

With the aqueous dispersion, it is possible to produce a concrete mixture according to the invention with fillers hitherto regarded as cement poisons. As a filler in the concrete mixture, the usual sands, but also any type of soil, contaminated or uncontaminated, and / or materials such as bauxite, volcanic ash, pumice and ash from incinerators can be used.

Research and Testing

Renolith has been the subject of dozens of independent studies assessing its performance in a variety of applications. Excerpts from selected studies are shown below.

C. Froehlich, "Renolith Technical Report 0199-29/01/99" DOW Europe SA, Horgen, Switzerland, 1999.

Renolith was evaluated in standard low cement sand/cement mortars and sand/soil/cement mortars for road construction and foundation applications. Standard laboratory test methods according to DIN EN 196 were applied.

Use of Renolith at the recommended dose had a positive impact on flexural strength, compressive strength, density, elastic modulus and water absorption reduction as shown below.

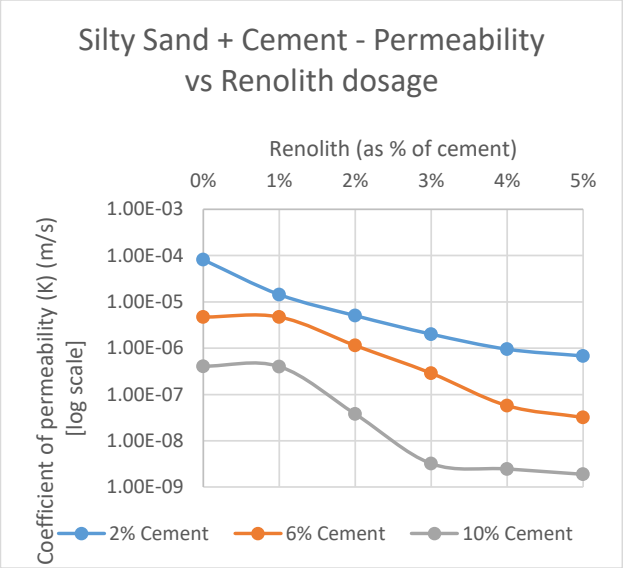
Results	Control: 10% cement, no Renolith	With Renolith at optimum dose	Improvement: Renolith vs Control
Cement/sand mortar			
28d-Flexural Strength (N/mm2)	2.29	3.83	67%
28d-Compressive Strength (N/mm2)	10.72	18.9	76%
Density (kg/l)	1.978	2.012	2%
E-modulus stat. (N/mm2)	11500	15633	36%
Water Absorption in % by weight	8.26%	6.65%	-19%
Cement/sand/soil mortar			
28d-Flexural Strength (N/mm2)	1.26	1.87	48%
28d-Compressive Strength (N/mm2)	5.35	7.42	39%
Density (kg/l)	1.907	1.968	3%
E-modulus stat. (N/mm2)	2967	5033	70%
Water Absorption in % by weight	12.40%	10.15%	-18%

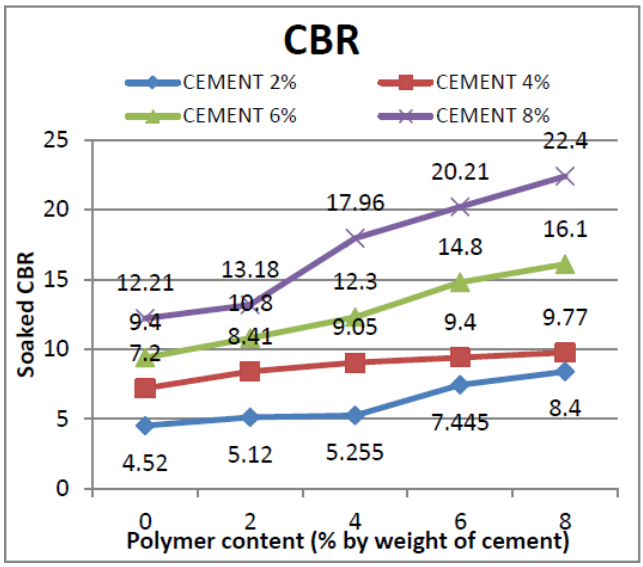
A. Singh and P. Garg, "Evaluation of Renolith as a subgrade stabilizer" in 50th Indian Geotechnical Conference, Pune, India, 2015.

Stabilised Silty Sand (SM) samples were made using 2%, 4%, 6%, 8% and 10% cement by weight of soil, and 1%, 2%, 3%, 4% and 5% Renolith by weight of cement. A curing period of 14 days was used to determine California Bearing Ratio (CBR), Standard Proctor test (MDD & OMC) and Permeability values.

Summary of Results:

- Renolith increased CBR and MDD values of silty sand or sandy silt soil.
- Renolith helps achieve high CBR values with use of less percentage of cement.
- 100x reduction in permeability with Renolith, compared to cement only stabilisation (2%, 6%, 10% cement).

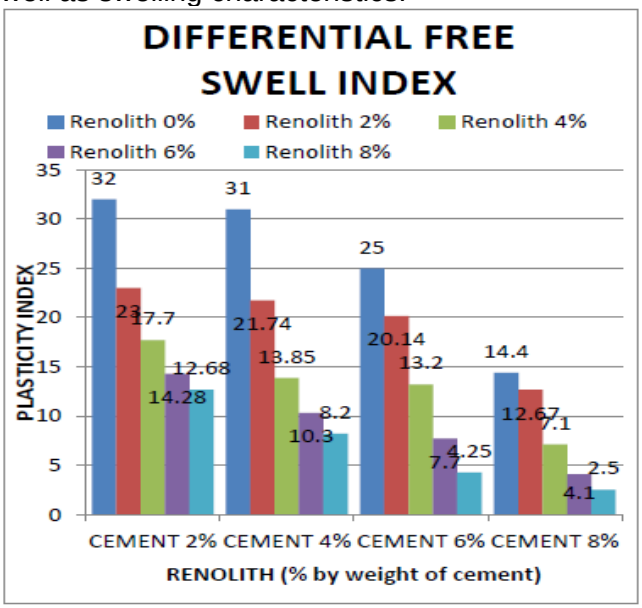


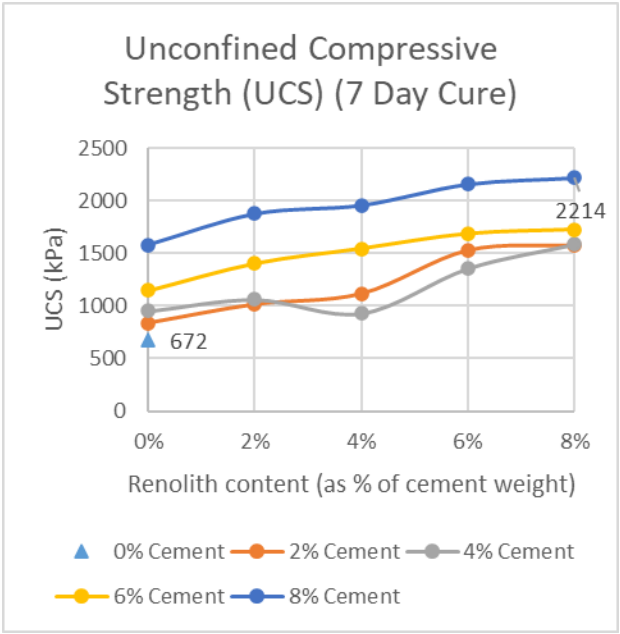


[V. Rajoria and S. Kaur, "Effect of Polymer Stabilizer on the Geotechnical Properties of Black Cotton Soil" in 50th Indian Geotechnical Conference, Pune, 2015.]

In Madhya Pradesh most of the area is covered with black cotton soil, which is highly cohesive and expensive in nature. The black cotton soil is problematic in construction due to its high shrinkage and swelling properties. This research paper investigated the feasibility of Renolith polymer as a solution to this problem. Soil samples were treated with different doses of Renolith polymer and cement.

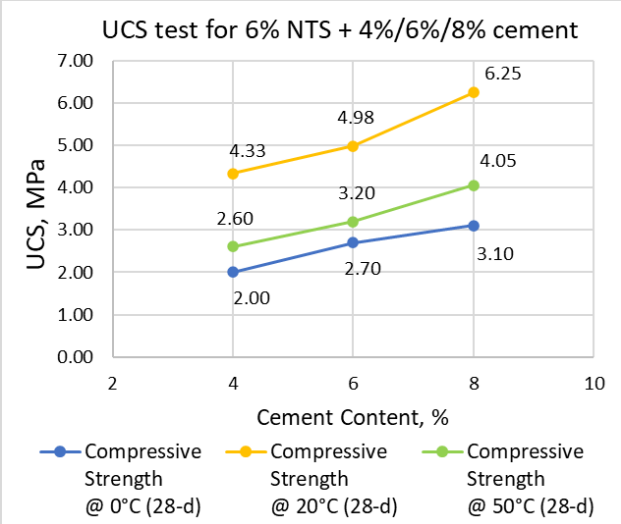
The addition of Renolith polymer caused a significant modification in engineering properties. The polymer addition showed considerable improvement in strength, CBR, as well as swelling characteristics.

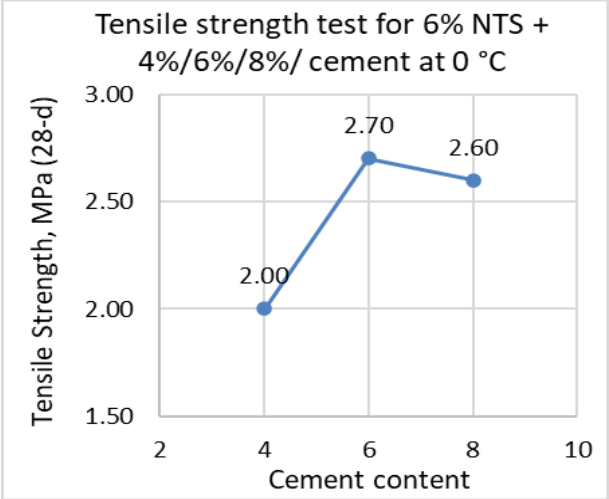




[V. Goncharenko, D. Larin and A. Yeremeychuk, "Application of Polymer Additives in Cold Recycling" Dorogi i mosti [Roads and bridges], Kyiv, Ukraine, 2016.]

The aim of this experiment was the theoretical and experimental substantiation of the possibility of using Renolith (aka NTS) polymer stabilizer in cold recycling technology by establishing the properties of the stabilised milled material depending on different amounts of cement added to the mixture. Renolith dosage evaluated was 6% w/w cement.





The obtained experimental data show that the milled material stabilised with cement and Renolith polymer additive can be used instead of bitumen emulsion.

A. Shuvaev, A. Smirnov and S. Kartavy, "The Construction Of Roadbeds on Permafrost and in Swamps from Reinforced Soils of Increased Strength," Civil Engineering Journal, vol. 6, no. 10, p. 10, 2020

The paper presents the history of the transport infrastructure of the West-Siberian oil and gas complex in the last century and ways to solve the problems of road construction in the twenty-first century.

The artificial stone material tested in Murmansk and Surgut based on the strengthening of local soils with inorganic binders with polymer additives using modern technologies allows it to be used instead of imported stone materials and reinforced concrete slabs for the construction of structural layers of road pavements, reinforcing slopes, as well as in hydraulic structures. The new artificial stone material is characterized by high strength and durability in areas with a temperature gradient of the external environment of more than 100 (from +50 to -50 °C).

The results of control tests conducted by MADI (STU), confirmed the materials of our research. The test results of 28-day-old samples are as follows: compressive strength was from 11 to 13 MPa, bending tensile strength — from 2.5 to 3 MPa, frost resistance coefficient — at least 0.85, water saturation — no more than 4%. Compressive strength of samples with the addition of Renolith is 80% higher than samples with cement alone. At the same time, a decrease in the period of curing is almost twofold. .... A significant improvement in the physical and mechanical parameters, and especially frost resistance, made it possible to expand the scope of reinforced soils not only in road construction but also in hydraulic engineering and underground engineering structures.

Renolith
Resilient, Sustainable, Nanoengineered Roads

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