

RoadCem Zeolite Stabilisation for the Water Utility Sector.



anglianwater

SEVERN
TRENT
WATER

United
Utilities
helping life flow smoothly

YorkshireWater

The Nano crystallization process developed by PowerCem Technologies is created by treating in-situ soil of any kind (organic and inorganic) with cement modified by RoadCem Zeolite technology.

The porous and intricate nature of zeolite structures enables the total hydration of the soil mixture, uniquely this allows cement to be hydrated up to 100%, reducing cement requirements by up to 30%. There is also a substantial increase in the generation of calcium crystals that provide increased resistance and mechanical properties in the stabilisation.

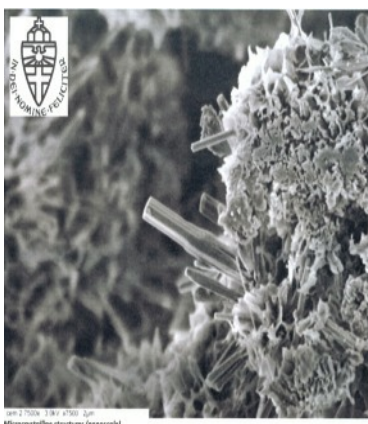


Zeolites are aluminosilicate minerals of porous nature, in their natural state they have a three-dimensional panel structure, which stands out for its ability to hydrate and dehydrate. These minerals are normally found in both sedimentary and volcanic and metamorphic rocks.

Based on the years of research by PowerCem BV in the Netherlands into the structure of zeolites in their natural state, more than 150 variations of synthetic zeolites were created from Nano technology processes which are now used to fulfil specific functions in the three PowerCem products; RoadCem, ImmoCem and Concrete.



- Improvement in strength parameters
- Higher fatigue resistance
- Supports high dynamic forces
- Higher resistance against thermal cracking
- High durability
- Reduced truck movements to site
- Treats silts, clays and organic soils and materials.
- In-situ treated soils can be used without surface protection.
- Sustainable low carbon technology
- Locks in any contaminants and is leachate safe



Stabilisation problems can be caused by UK weather. The higher air and ground temperatures occurring in summer accelerates the hydration process, with cement alone ravelling and brittle fracture of the stabilised layer can take place. When RoadCem is added this mode of failure is largely eliminated.

During the colder wetter months of the year adding RoadCem accelerates the hydration process, also improving thermal properties in the stabilised layer.

Wet soils can have a damaging effect on cement stabilisation, both during installation and when the stabilised layer is in use. RoadCem allows installations in all but the worst of weather conditions. Allowing work to continue on site without delays.



Un surfaced RoadCem bound soil base photographed after two years construction plant trafficking.



The same section as above seven years later in the early winter of 2020.

In the late Summer of 2015 with works completed our contractor DNS (Midlands) Ltd returned to site to; mill areas back to soil and converting other stabilised sections to car parks and permanent site roads.

For some areas the original un-surfaced RoadCem soil concrete was adequate for ongoing use. For the car parks a thin gravel surface topping was added.

For the permanent site access roads after cleaning, these were given a tack course and finished with a resin and chip wearing course. Bonded directly to the soil concrete this should prove to be durable and maintenance free.

Early in 2013 we were invited by MWH Global to their Clay Mills site to meet the design team for the planned Cambridge STW redevelopment. The largest planned project spanning both AMP4 and 5 programmes.

The site in Cambridge had limited access from the busy A14 and needed a solution which reduced truck movements to and from the site by allowing the re-use of all the existing weak organic soils for construction purposes.



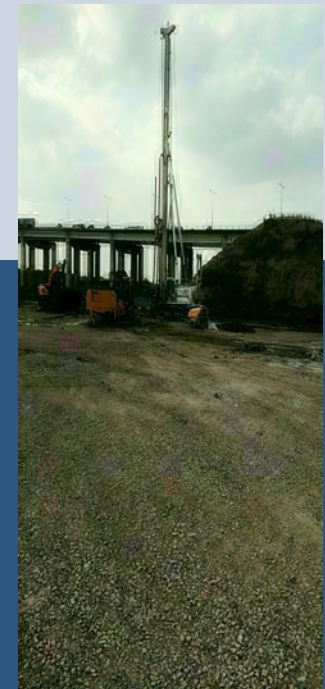
The existing ground was a mixture of soft brown silty clays with occasional layers of peat.



Following soil sample testing at our laboratories. Rogers Leask Consulting Engineers of Derby prepared mix designs to meet the required 100kN/m² loadings for heavy tracked plant and the 13tonne axle loadings of delivery lorries for the two-year construction project. These designs were warranted to be safe for the outrigger loadings and crawler mounted cranes up to 84 tonne per m² being used on the site



Working for the GCA Alliance a 9,000 m² piling mat was constructed with RoadCem from the existing weak silt clays



Shortly after a RoadCem presentation the GCA Alliance team based at Lingley Mere, Warrington.

The area to be treated was mainly made ground with a high organic silt content.

A request was received for engineered designs for a soil piling mat for use with Bauer BG40 Piling rig.

In addition to buried foundations the remains of a number old piles were excavated during construction.

A certified design based on BISAR design software was produced by Rogers Leask Consulting Engineers of Derby.

The soil piling mat ensures a safe flat platform with no raised edges.

The work was carried out by our contractor DNS (Midlands) Ltd.

With easy set up and no deflection the visco elastic bound soil piling mat was fast and safe to pile.

For this application a thin gravel surface was added to give extra traction and avoid any dust created during piling.

The high E Modulus and improved visco static behaviour of the RoadCem soil mat. Will prevent cracking and bounce during the piling programme.



Allowing engineers during their design process to retain the mat in-situ, as a blinding base or actual foundation element.

During stabilisation several tonnes of house bricks, concrete and reinforcing steels, were relocated to the far corner of the site.



An impermeable operating slab for the washing of bio filter media.

Following on from previous works carried out with RoadCem soil concrete technology by our contractor DNS (Midlands) Ltd. The Severn Trent AMP 6 Alliance chose RoadCem for this project. After removing the turf layer the existing soils were mixed to a depth of 300mm with our patented RoadCem soil concrete process. To form a durable impermeable slab for the media washing plant.

RoadCem soil concrete can be used without surface protection, even in trafficked areas for both temporary and permanent works.



Treating the sites top soils, makes sense from a financial and sustainability angle.

Reducing construction time and the carbon footprint of the project.

Local planners and residents should also look favourably on the big reduction of trucks to and from the site.

The overall environmental impact of importing stone for for this type of construction work is 150 to 250% higher. With Human Toxicity levels even higher in the region of 300%



**Trescott Sewage Treatment Works.
Perton,
Wolverhampton**

January 2018

Contractors:

**Mott Macdonald Bentley
for Severn Trent Water
AMP6.**

**Haul road and washing
plant platform.**



The Weather during the construction was wet but fairly frost free for the time of year. With no delays encountered during construction.



RoadCem is an innovative material successfully used by MWH to stabilize poor ground conditions and form a piling for a 75m² concrete structure (Activated Sludge Plant) at Clay Mills WwTW.

The ASP ground stabilisation at Clay Mills is a first for the UK water industry.

The benefits of using RoadCem on the £45m upgrade project at Clay Mills WwTW include:

- Prevented 2000 heavy vehicle movements to site, significantly reducing H&S risks and carbon emissions
- Saved £70k in project costs
- Reduced construction programme by three week
- Eliminated the planned blinding' of the ASP structure.



Visco-Elastic behaviour

Delft University of Technology, simulated the properties of absorption of dynamic forces such as driven piles in to soils stabilised with PowerCem Technology. Based on other RoadCem soil concrete projects such as the piling platform at Clay Mills.

The result clearly showed that these stabilisation's could bear high intensive dynamic forces such as the driving of piles through the RoadCem soil stabilisation.

No cracks occurred in the periphery of the piles, nor in the complete RoadCem treated structure.

By observing the longitudinal displacement mode after excitation, the dynamic modulus is obtained. Which gives you the dampening characteristics and the visco-elastic properties of the mat.

It is clear that adding RoadCem to cement bound materials reduces vibration, an essential property for piling mats, road base and rail track applications.

"The Merit Award winner of the Small and Medium Project category was Clay Mills STW, submitted by MWH, for its precast final settlement tanks where significant project cost and time savings in creating an aesthetic solution impressed the judges.

Also their soil stabilisation project which involved the introduction of RoadCem a new product to the UK and combined with innovative and courageous thinking by those involved marked them out as winners."



Driving piles through the RoadCem stabilised soils was fast and safe.

With no deflection and easy set up.

Ambergate Treatment Works



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MWH Global have always been known for introducing innovation in construction, particularly in the challenging water utility sector.

Following the pioneering success of the utilisation of RoadCem soil concrete technology on their project for Severn Trent Water at Clay Mills.

Simon Whittaker and his team were keen to use RoadCem to treat the tricky ground conditions at the Ambergate Water Treatment works.

The in-situ stabilisation of soils requires specialised mixing plant such as Wirtgens and Stehr plant and a heavy roller.

Because the remote site access at Ambergate restricted heavy plant and made stone import difficult.

Simon and his team improvised very successfully with RoadCem, mixing and compacting with their light onsite plant and equipment.

The resulting access and working platforms proved cost effective and fit for purpose, providing a durable solution in this wet site.

The slightly rough surface resulting from preparation with potentially unsuitable plant proved to be a bonus, giving excellent traction especially on the slopes.



Wolferton Pumping Station Kings Lynn



The very soft silty clays and high ground water levels presented difficult conditions to prepare an adequate working platform for the heavy plant required for the works including CFA Piling and Sheet Pile installation.

We were approached by Kevin Lait Senior Estimator for Breheny Civil Engineering to design and construct a safe, heavy duty crane operating platform to cope with loading up to 5.7kg/cm².



RoadCem soil concrete was also used for the piling mats, site access roads and site compound.

A RoadCem construction was made using just the existing soils to provide a strong and durable working platform.

The use of RoadCem reduced the working platform preparation time, and achieved cost savings compared to a more traditional approach to remove soils and import stone.



Auger drilling through the RoadCem stabilised soils was fast and safe.

With no deflection and easy set up.

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Sample testing of the soft brown silty clays showed that a Rodgers Leask RoadCem design would safely meet the loading requirements for HGV construction traffic and heavy tracked cranes.

Together with our design partners Rodgers Leask Consulting Engineers of Derby. We attended meetings at the Leeds offices of MMB to discuss a RoadCem in-situ a bound soil base solution for their forthcoming Hull WwTW scheme.

Requirements onsite included temporary haul roads and compounds for the HGV construction plant and a Piling mat for the 55 tonne Juntann PM20 piling rig.

MMB confirmed that they also intended to retain the RoadCem in-situ bound soil base for permanent pavement/foundation structure with a required 60 year life span.



Despite the very wet weather and slightly unexpected areas of soft wet silt underlying the construction site, there were no problems encountered during installation and the intention to utilise the RoadCem base for permanent road and structure foundation base all went to plan

JNBentley

Andrew Tindall – Tuesday at 4:08 PM


On a typically horrendous weather day in East Yorkshire another major milestone for Hull WwTW has been met. Piling for the new elevated Inlet Works has commenced following several months of enabling. Note the Roadcem piling mat stabilisation which is looking like a very good Temp works saving, and James Bishop driving BIM 360 for the fully digital onsite QA checks of piles. Hopefully weather improves for FRC works for the rest of the year.

Well done to the whole team.

cc: James Bishop, Jason Angus, and Christopher Wilcock

FILES

- pile1.jpg
- pile2.jpg
- pile10.jpg
- pile7.jpg



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