IN-SITU TREATMENT OF SOILS AND MATERIALS

A cost-effective approach and a durable structure
In conventional road construction and maintenance, large quantities of materials are excavated and removed and large quantities of imported materials are added. This process is costly and it also depletes natural aggregate resources and hence conflicts with Eurovia’s sustainable development policy. In-situ treatment techniques using existing materials have therefore undergone substantial development. Initially, these techniques were confined to earthworks, in which they were employed to stabilise poor soils for use as fill, but they are now frequently proposed for use at a variety of levels in the construction of a wide range of road infrastructure projects.

Eurovia offers a range of effective, responsible solutions that meet the growing demand for high quality, cost-effectiveness and environmental protection.

**KEY BENEFITS**
- Broad range of applications
- Substantial materials, transport and fuel savings
- Reduced disruption for users

**KEY FIGURES**
- Up to 500 mm depth
- Over 30 years of experience
- Track record totalling millions of m²
PERFORMANCE OBJECTIVE

In-situ treatment modifies the physical, chemical and geotechnical characteristics of the material – typically the natural soil in place, but sometimes an imported material – to rapidly and durably improve its mechanical behaviour.

To achieve this, one or several products are mixed into the material to modify its moisture content, immediately stabilise it and increase its mechanical performance over time.

Many materials can be treated in this way: loam, sand, clay bound gravel, chalk, etc.

The binders employed are hydraulic – lime, cement and hydraulic road binder. Bentonite can be used to enhance impermeability of treated materials when required.

This solution produces a durable structure.

ENVIRONMENTAL OBJECTIVE

Building on its experience with in-situ stabilisation techniques, Eurovia has gradually applied them to “upper” pavement layers. The company now offers particularly resourceful and cost-effective solutions for pavement base courses and for industrial and retail surfaces.

In-situ treatment techniques lend themselves to a wide variety of applications, ranging from earthworks to pavement layers. They are now widely employed in fill, subgrade and capping layers (see Setra/LCPC Technical Guides: “Fill and Capping Layers” and “Treatment of Soils with Lime and/or Hydraulic Binders”). All these applications generate substantial savings in materials and thereby contribute to environmental protection.

Soil treatment with bentonite is typically used in the construction of environmental protection structures such as lining and capping of controlled landfills, treatment facilities, basins, etc. For example, the Geoplast® waterproofing geocomposite uses a passive waterproofing barrier based on materials treated with bentonite.
A PAINSTAKING PROCESS

Of the main parameters directly influencing project definition, the hydrological environment and the climate conditions at the site receive special early attention. A laboratory study is indispensable before proposing any treatment treatment. Eurovia bases its work on the French standards P 94-100 “Soils: investigations and tests — soil treatment suitability test” and P 94-102-1 (and 2) “soil treated with cementitious binder, combined with lime if applicable, for use in capping layers”.

An understanding of the materials and binders and the research and studies carried out in Eurovia’s specialised laboratories and in the field are essential, in order to:

> identify and assess the characteristics of the soil or materials to be treated,
> verify their homogeneity and the absence of products (sulfates, nitrates) that could impede the effect of the hydraulic binder,
> assess the characteristics of the various binders available and verify their possible applications and conditions of use in the local technical and economic context of the project,
> define the performance of the treated materials in the laboratory and track their behaviour in situ.

The company’s laboratory is closely involved in all stages of the project, where it:

> controls the constituents and may adjust and modify the parameters of the composition (water content, binder dosing, etc.),
> adjusts the equipment settings and calibrates the equipment, to achieve optimum operating conditions and results,
> controls laying quality: binder dosing, water content, depth of mixing, degree of milling of fine-grained soils.
> measures density and, as appropriate, permeability,
> measures bearing capacity (static plate bearing test or dynamic Dynaplaque test on the trial area), to ensure the strength of the structures built.

A MADE TO MEASURE MATERIAL

The operation employs specialised machinery. Eurovia uses modern, high-performance machines suited to the needs and requirements of the various stages of the project (stabilisation machinery is presented in the French P 98-712 standard “Distributors for fine-powder binders and in situ soil mixers”):

> a powder binder spreader using a weight-controlled volumetric dosing system ensures longitudinal and transverse uniformity of the quantity of binder spread,
> a very high powered (400 to 500 kW) pulveriser mixer blends the materials with the binder to achieve a homogenous mixture to the selected depth. The machines used by Eurovia operate at large depths and widths: up to 500 mm depth and 2.5 metres width. They are equipped with rotors that can be fitted with a variety of tools (teeth), depending on the nature of the materials to be treated,
> a powder binder storage silo, a mobile spraying system to control mixture water content, graders and a compaction train suited to the material treated and the depth of treatment round out the equipment used in this type of work.