5. Slope stabilisation and erosion control

Compost can be used with a range of geosystems to create an eco-engineering solution

Soil erosion in construction activities is moving up the political and legislative agenda. Wind, rain and foot traffic can erode soil, particularly when it contains low levels of organic matter. This reduces the ability of plants to establish, grow and remain healthy. The reduction in plant growth and subsequent plant residue exposes the soil, perpetuating the erosion process, resulting in sediment loss and potentially higher maintenance costs.

Compost can be applied in areas of particular concern in combination with an engineering solution for erosion control and to encourage plant growth. Combining engineering solutions and vegetation is termed ‘eco-engineering’ and can be used to stabilise riverbanks and highway embankments. The use of eco-engineering for stabilising engineered slopes can be environmentally preferable and cost effective compared to traditional ‘hard-engineering’ solutions, such as the use of soil nails or impermeable concrete facings.

Compost can be applied directly or incorporated with a range of products to generate the following eco-engineering solutions:

- **Compost blanket**: a layer of loosely applied compost that acts like a blanket covering the surface on which it is applied, and can be used on a slope or flat land. The mixture of fine and coarse particles mat together creating a blanket that has shown to hold on 2:1 slopes, as well as more severe slopes, without slipping.

- **Compost sock**: a tubular geotextile mesh which is filled with compost and can be used as vegetated soft armouring systems. They are designed to stabilise banks and prevent erosion from flood waters and precipitation runoff, and used as ongoing storm-water management.

- **Compost geosystems**: there is a variety of geotechnical cellular confinement systems (geosystems). They are designed for an array of engineering solutions including soil and slope reinforcement, drainage and erosion control. More information on geosystems can be found on the AggRegain website; and

- **Vegetated gabion**: is a square container of galvanized wire, which is filled with stone to protect shorelines and river banks against erosion and stabilise slopes at the toe while at the same time allowing free movement of water to the underlying soil. Compost socks can be placed on the outer face of the gabion which provides a suitable moisture retentive and nutrient rich substrate for vegetation.

Investigating erosion control on the A421

Between 2009 and 2011 trials took place to investigate the use of compost blankets and compost socks in preventing and controlling erosion on an engineered embankment along the A421 in Bedfordshire.

Initial economic analysis indicated that in all instances, compost based erosion control techniques are priced competitively, or are less expensive than conventional techniques.

Compost blankets and compost socks were applied to the 2:1 slope and compared to other erosion control applications. Results showed that the compost socks alone reduce runoff by 90%. This significantly reduces erosion and sediment loss.
Compost blanket for erosion control

The project examined the effectiveness of compost to stabilise the surface and subsurface of an engineered slope in order to both prevent erosion and enhance vegetation establishment.

Cost savings and other benefits

Compost blankets can increase grass seed germination and re-growth, enabling the swift development of vegetation in order to improve stability. This makes it ideal for use in slope stabilisation programmes, where soil erosion and an inability to support vegetation is a common problem that can lead to slippages – a key concern for highways contractors. Compost offers an economically attractive option to combine with a range of proprietary products to create an eco-engineering solution.

Eco-engineering solutions, such as compost blankets can yield cost savings compared to conventional techniques. For example, at a field trial that utilised compost blankets the following cost benefits were highlighted:

- the cost of compost was approximately £0.50 per m² delivered to the site and the use of geotextile was of similar cost for the same coverage;
- the application of geotextile is considered to be more labour intensive with an approximate associated cost of £200 per day for a 100m² coverage;
- the machinery costs for covering the same area (100m²) with compost was £100 per day; and
- subsequent fertiliser costs for the geotextile could more than double the cost of geotextile compared to the compost treatment.

Application of compost

Compost blankets can be applied on 2:1 slopes however, on severe slopes lock down netting can be applied over the compost to secure it. Compost can be pneumatically blown across the site using specialist equipment or raked and flattened with an excavator to place the compost on the bank.

Compost blankets are most appropriate for use in sheet flow water management situations to reduce rill formation rather than controlling concentrated flows with high velocity flood water. However, compost berms or slope interruption socks can be used in conjunction with this technology to further reduce the flow velocities of the water.

Compost blankets can also improve the moisture holding capacity and encourage vegetation establishment. Field trials using 50mm compost blankets have been shown to hold 12.5 to 25mm of water. A recent trial demonstrated that surface application of compost was better than incorporation to 10cm depth.

Compost socks can be specified in a range of sizes and contain a range of growing media, depending on the particular end use. They can be vegetated or non-vegetated, can be left in place to provide permanent protection or cut open and the compost spread across the site when a project is completed and the geotextile removed.

The weight and anchoring systems can withstand storm run-off velocities and hydraulic shear stresses. Soft defences can be cost effective, multi-purpose in nature and can often benefit existing wildlife, by providing suitable habitats. Compost socks can serve as a basis for reed development and be utilised as a filter media to control potential leachate runoff.
Compost socks can be manufactured by either:

- **On site filling**: long lengths of compost sock can be created on site using a compost blower or modified bucket with an exit pipe and dropped into place as they are produced. This is possible if the site is accessible.
- **Off-site filling**: where access to the site is limited or where damage from heavy plant is undesirable or the site is too remote for a compost blower to reach, compost socks can be filled off site. Compost socks can be stacked on to pallets and delivered to site in long lengths or short lengths to avoid manual handling issues. Installation of long lengths can be undertaken directly from the pallet using a quad and trailer.

A site-specific methodology should be derived for the transport of compost-filled socks. Once positioned, compost socks can be secured in place with pegs. During placement a cradle can be constructed to aid lifting in a controlled manner.

**Stabilising the banks of the River Don**

An innovative approach was used to stabilise the clay bank of the Centenary Riverside Wetland Nature Reserve, Rotherham to protect it from scour erosion. PAS 100 compost was used to fill the socks which were sown with a fast growing seed mix to provide vegetation cover.

The compost socks installed along the riverbank have significantly reduced erosion and plants are thriving in the growing medium provided.
New Cut Canal restoration project
Warrington Borough Council

A section of contaminated silted up canal was restored as part of a programme to create an Urban Ecology Park from a problematic post-industrial site.

Bespoke gabions containing socks filled with compost and recycled aggregate form a major part of the canal’s transformation in terms of stabilisation of contaminated silt and the establishment and management of vegetation for conservation value.

The project has led to the successful restoration of a 300m section of canal open water using the bespoke gabion designs (including compost socks as a means of creating a new landscape and habitat). The specification for ‘green’ gabion trials met the practical requirements of the project and led to the establishment of vegetation along the waterside of the canal and new bank.

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