

# Recycling carpets



## Carpets Recycling Conference, 2018:

*It was stated that only 35% of waste carpet was being recycled in the UK compared to 85% being recycled in European countries. Therefore, the aim of this project is to work with manufacturers to develop new opportunities for recycling/re-use.*

**The problem:** Carpets are multilayer mixtures of different polymers and inorganic fillers that are difficult and costly to reprocess upon disposal. 400,000 tonnes of carpets waste are sent to landfill in the UK annually, however, the landfill option is becoming increasingly impractical due to increasing costs and the physical limitations of the number of sites available. In addition, carpets are non-biodegradable and reduce the availability of landfill for other wastes.

## The objectives:

- Identify valuable materials in carpet waste/post-customer carpets.
- Research procedures for recycling carpet waste.
- Develop suitable applications for carpets waste and their components.

## Academic team:

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## The proposal:

Projects	Applications
Small scale project	
Shoddy material	<ul style="list-style-type: none"><li>• Use as filling material for granular soil and to improve the particles size distribution of the soil.</li><li>• Carpet waste fibre reinforced soil.</li><li>• Carpet waste fibres reinforced concrete.</li><li>• Road construction: reinforce and stabilise the weak soil in the road layers.</li><li>• Slope stabilisation.</li><li>• Educational purpose: it will be useful to use it in University's laboratory to show the behaviour of reinforced soil instead of synthetic fibre.</li><li>• Waste to energy.</li></ul>
Cut waste yarn	
Unbacked carpet & Edge trimming	
<b>Advantages:</b> <ul style="list-style-type: none"><li>• To increases the density of soil, which will then increase its strength.</li><li>• Reduce the occurence of spalling at joint edges in concrete.</li><li>• Improve the shatter resistance, toughness, and ductility of concrete.</li><li>• Improve the shear strength, compressive strength, bearing capacity, post-peak load strength retention, and the elastic modulus of soil and concrete.</li><li>• Cost effective solutions, saving the use of non-renewable resources.</li></ul>	
Large scale project	
Woven geotextile	<ul style="list-style-type: none"><li>• Ground reinforcement, improvement, and separation of weak soil.</li><li>• Reinforces soft ground and embankments.</li></ul>
Non-woven geotextile	<ul style="list-style-type: none"><li>• Filtration purpose.</li><li>• For ground drainage: Provides water drainage and gas venting in the plane of the geotextile.</li><li>• Improve soil quality and structural stability.</li></ul>
<b>Advantages:</b> <ol style="list-style-type: none"><li>1. Improves soil shear strength.</li><li>2. Permanently prevents the mixing of two materials: it is useful when there are two different soils (e.g. silts and clay) and it is desired to prevent mixing them due to the loading and the environmental condition.</li></ol>	

## The outcome:

- Carpet fibres can enhance the loading capacity and stability of soil structures.
- Geotextile fabric could be used for:
  1. Filtration: Provides permanent mechanical and hydraulic filter stability.
  2. Drainage: Provides water drainage and gas venting in the plane of the geotextile.
  3. Reinforcement of soils and concrete.
  4. Waterproofing: Acts as a support material for impregnations with bitumen or plastic-modified sealing materials.
  5. Separation: Permanently prevents the mixing of two materials.
- Education purpose; useful to use in school laboratories to show the behaviour of reinforced soil instead of synthetic fibre.
- Carpet waste to energy (via incineration).

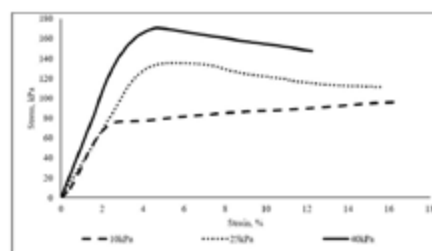


Figure 4.19 Stress-strain relation for fibre (O)reinforced soil at different confining pressures and OMC.

## Future research:

- Investigate changing the properties of carpet materials to biodegradable materials.
- Extensive experimental works is required to investigate the optional geotechnical and construction applications described above. An initial investigation should be carried out with manufacturers' assessing the feasibility of the various opportunities and ranking in order of potential economic viability. This would then allow a targeted programme for developing innovative and cost-effective solutions for manufacturers.