



Do microplastics from the road get washed off into the environment?

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Microplastics can come from a variety of sources including larger plastic pieces that have broken apart, resin pellets used for plastic manufacturing, or in the form of microbeads, which are small, manufactured plastic beads used in health and beauty products.

Plastic

Plastics are derived from natural, organic materials such as cellulose, coal, natural gas, salt and, of course, crude oil. Crude oil is a complex mixture of thousands of compounds and needs to be processed before it can be used. The production of plastics begins with the distillation of crude oil in an oil refinery. This separates the heavy crude oil into groups of lighter components, called fractions. Each fraction is a mixture of hydrocarbon chains (chemical compounds made up of carbon and hydrogen), which differ in terms of the size and structure of their molecules.

Two main processes are used to produce plastics - polymerisation and polycondensation - and they both require specific catalysts. In a polymerisation reactor, monomers such as ethylene and propylene are linked together to form long polymer chains. Each polymer has its own properties, structure and size depending on the various types of basic monomers used.

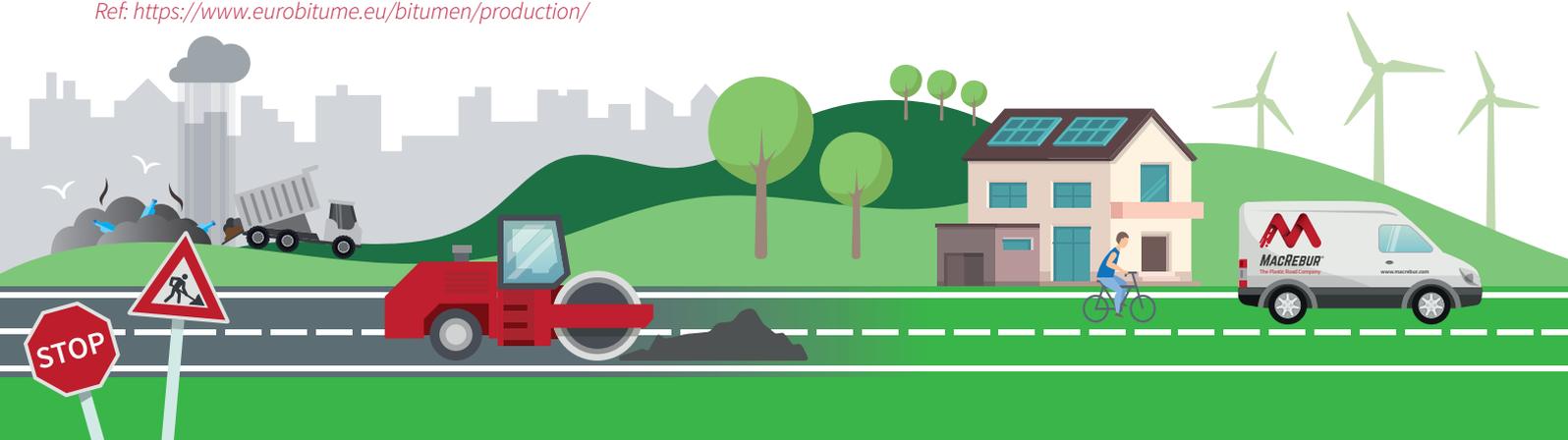
There are numerous types of plastics available, and many quality gradings within those types. They can be grouped into two main polymer families:

- **Thermoplastics** (which soften on heating and then harden again on cooling)
- **Thermosets** (which never soften once they have been moulded)

Bitumen

The bitumen we use in our roads and buildings is refined from carefully selected crude oils. A variety of different refining methods produce different kinds of bitumen and allow the manufacturer to produce specific characteristics in the bitumen. Producers often blend multiple crude oils together to produce consistent, high-quality bitumen that meets precise engineering specifications.

Ref: <https://www.eurobitume.eu/bitumen/production/>



Road Standards

In UK and Europe, the BSEN asphalt standard for public roads allows for “constituent material to be added in small quantities to influence specific properties of the mixture.” These constituent materials include “inorganic or organic fibres or polymers” and “for improvement of the mechanical properties, the workability or the colour of the mixture.”

Plastic Roads

Asphalt is made by mixing aggregates (stone, sand, and gravel) and bitumen together. The bitumen in an asphalt mix accounts for up to 10% of the total mix of asphalt. The remaining 90% is made of aggregates.

When a local authority lays a ‘plastic road’ 6% of the bitumen content is replaced/extended with waste plastics. This accounts for approximately 3kg replacement/extension in every 1000kg of asphalt made; so waste plastics in a ‘plastic road’ account for 0.3% of the total asphalt tonnage mix.

Only certain plastics can be taken from the waste stream and used to enhance an asphalt mix. For example, plastics are selected that melt within the temperature the asphalt manufacturers heat their asphalt too. Asphalt manufacturers usually don’t heat their asphalt above 180 Degrees Celsius so as not to burn off the bitumen and release harmful chemicals from that bitumen. Many polymer groups don’t melt until above 200 degrees Celsius and so cannot be used in a MacRebur plastic road mix. MacRebur activators are added to the chosen waste plastics in order to make sure the plastics fully mix in and melt with the remaining bitumen in an asphalt mix making sure there are no lumps of plastic left in the asphalt.

The Result

Plastic roads offer waste plastics to act as plasticisers in bitumen. These plasticisers extend the softening/glass-transition points of the bitumen within the ambient temperature range.

Both plastic and bitumen are mostly hydrocarbon. When they are heated and become liquid, the two together make an inseparable mixture. Intermolecular forces also hold them together when they solidify. In higher concentrations, polymer properties dominate and the formulation will lose its effectiveness for purpose, and so the right mixture, in the right proportions are essential.

Using waste plastics as plasticisers in roads enhances the asphalt mix making it more durable as a road surface. As long as the asphalt is heated to the correct temperatures and the asphalt manufacturer and the plastic road company adhere to the highest quality control standards, there are no microplastics present in a ‘plastic road’; only a resultant enhanced asphalt.

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