DUST/BLOKR® PB

(aka DUST|STOP)

The Polymer Solution

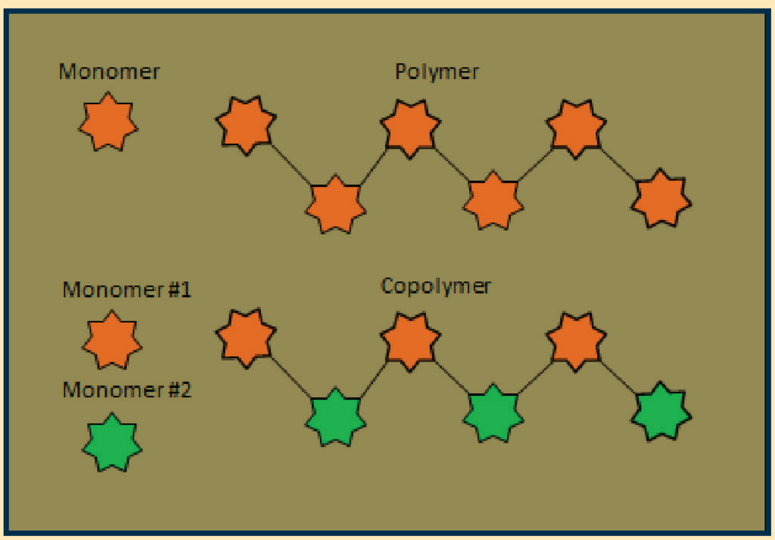
Introduction

Polymers have always been a part of our natural world. In our bodies, our muscles and bones are made of the polymer we call protein. Our genetic material, DNA and RNA, are also polymers. The cellulose we find in all plant material is a polymer, as are the complex carbohydrates we find in bread and pasta. Rubber is a good example of a naturally occurring polymer. Synthetic (man-made) polymers include many fabrics like rayon, nylon, dacron, and polyester.

Buiding Blocks

The name polymer gives an indication of the structure of these materials. "Poly" means many, and "mer" means units. Polymers form when many of the same molecule, or similar molecules, called monomers attach like beads on a string. These "beads" are the monomers, and the "string" is the polymer. Polymeric structures are either long chains of repeating molecules (called macromolecules) or large networks of repeating molecules. Usually, the chain or network has a carbon backbone with hydrogen (H) and other elements arranged on it such as oxygen (O), nitrogen (N), fluorine (F), silicon (Si), and sulfur (S). Hence, most polymers are organic materials. A copolymer is the combination of two different monomers.

Monomer to Polymer Relationship



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Note: these are examples only and do not represent actual polymers.

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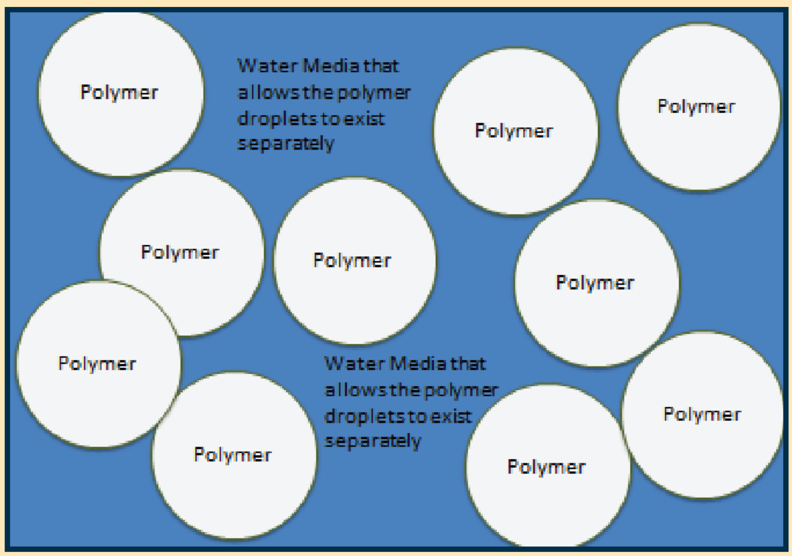
Emulsion- the Delivery System

An emulsion consists of tiny droplets of polymers suspended in a solvent (water) rather than dissolved in the solvent (water). Using water as the dispersion medium creates inexpensive, non- flammable, nontoxic, and relatively odorless systems. Water is inexpensive, stable, and environmentally friendly. It provides an excellent heat transfer and low viscosity. In general, polymer dispersions contain 40 – 60% polymer solids and comprise a large population of polymer particles dispersed in the continuous aqueous phase (about 1015 particles per mL). The particles are within the size range 10 nm to 1000 nm in diameter and are generally spherical in shape. A typical particle is composed of 1-10000 macromolecules, and each macromolecule contains about 100 – 106 monomer units.

Polymer Emulsion - droplets of polymer suspended in an emulsion surrounded by water and surfactants.



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How It Works

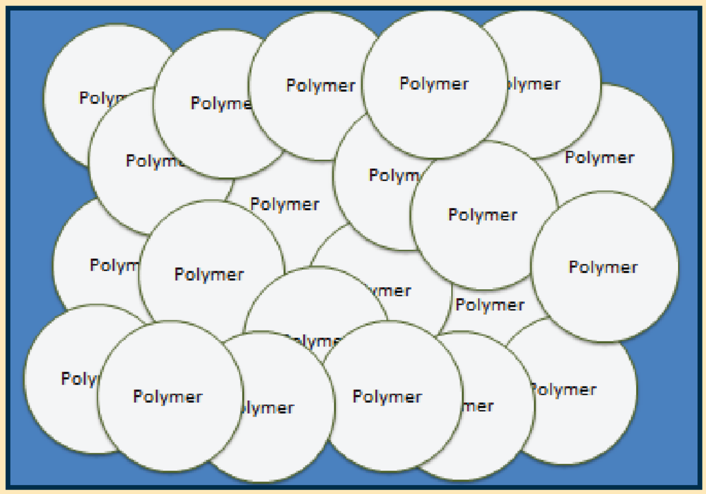
After application of the emulsion to the area or pile requiring erosion control, the water evaporates and the polymer particles pack closely together to form a continuous film. The application of DUST/BLOKR®/PB leads to the isolation of the polymer by the removal of water. In this way,

DUST/BLOKR®/PB transforms into a polymer film. The film formation process occurs in three major steps:

STEP 1:

The polymer particles come into close contact with each other by evaporation of water.

Once exposed to air the water begins to evaporate reducing the space between the droplets causing them to come inot close contact.



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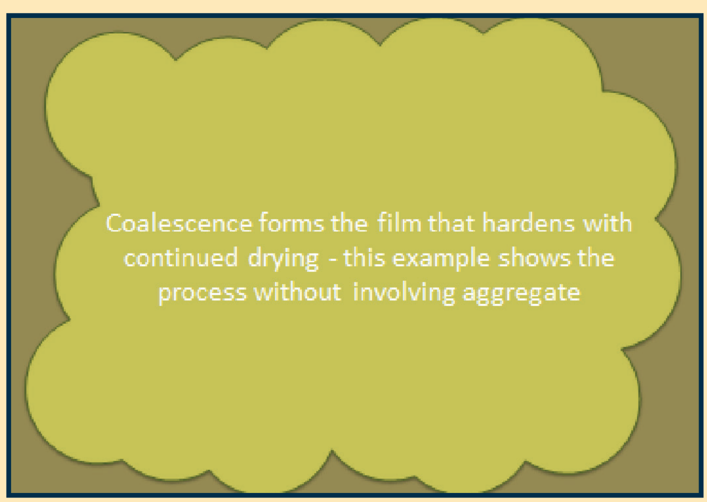
STEP 2:

As more water evaporates, the particles undergo deformation to form a void free solid structure, which is still mechanically weak.

Once enough water has evaporated, the walls of the droplets cannot maintain their shape and break against other droplets - the polymers within the broken droplets intermix - this is called Coalescence.



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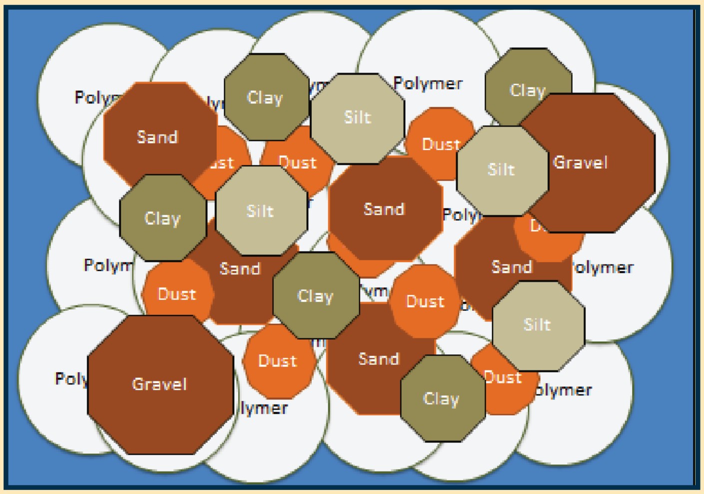
STEP 3: Fusion occurs between adjacent particles to generate a mechanically strong film. The ability for DUST/BLOKR®/PB to coalesce into a durable, strong, water resistant film allows it to encapsulate all the dust generating material to prevent it from becoming airborne.

Now we introduce the dust causing aggregate and dust particles of a typical road.



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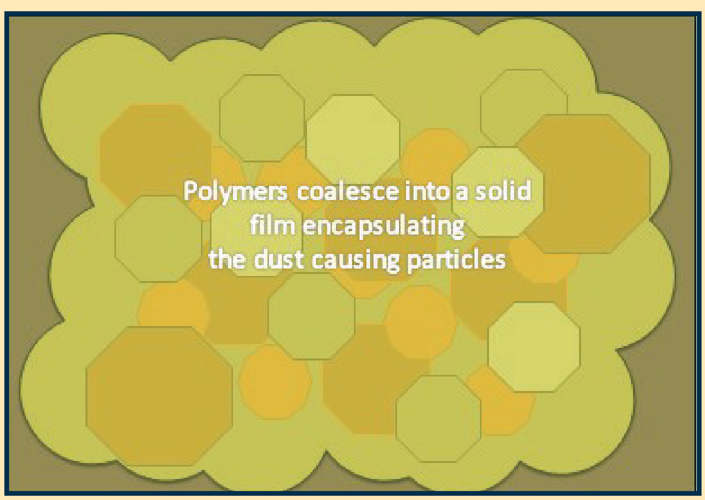
Once the DS product has coalesced it surrounds and encapsulates all of the dust, sand and gravel.



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The key is the transition between wet, dispersed polymer and dry film. The application temperature should be above the minimum film forming temperature (MFFT) of DUST/BLOKR®/PB which corresponds to the glass transition temperature (Tg) of DUST/BLOKR®/PB in the presence of water.

The design of DUST/BLOKR®/PB's proprietary copolymer formula was targeted to take advantage of both thermoplastic (thermoplasts) and thermosetting (thermosets) polymer behavioral characteristics.

DUST/BLOKR®/PB behaves primarily as a thermoset as it becomes permanently bonded or "set" by chemical reactions (coalesce) that take place when heated (evaporation) and results in a permanent irreversible change. These reactions result in a strong, hard, heat resistant film that encapsulates the surface. The resultant film also has characteristics of a thermoplast in that when it is heated it softens allowing the film to flex and not break during periods of hot weather. When tested to 55oC a sample of DUST/BLOKR®/PB becomes pliable and can be bent and stretched (with effort) but returns to its original shape and size.

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