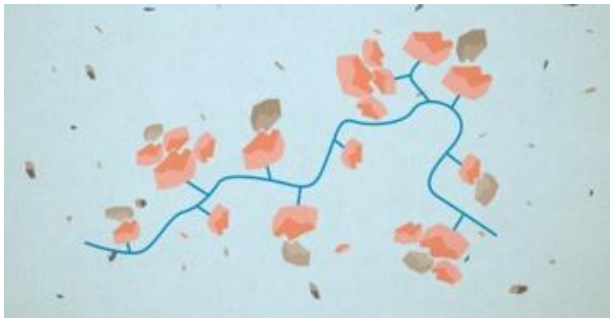
Polymers in water and solids recycling

Polymers have many different uses. We use polymers to help produce recycled water and biosolids from wastewater.

How do polymers help produce recycled water?

Polymers help remove tiny particles from wastewater to produce recycled water.

We add chemicals called coagulants that neutralise surface charges on particles. This allows particles to stick together rather than repel. We use long chain polymers, called flocculants to stick these particles together into larger clumps called flocs. We can then easily separate these solid flocs from the water.



Polymer chain sticking particles together, forming flocs.

How do polymers help produce biosolids?

Polymers help us separate excess water from organic solids in wastewater, to form a transportable fertiliser.

We collect scum (fats, oil and grease) and sludge (food scraps, excrement and microbes) from the wastewater and add polymers for flocculation. We take these biosolid flocs and remove the excess water using a press or centrifuge. This makes the biosolid lighter and transportable.

Did you know?

Biosolids are still mostly water and contains about 20% total solid. We help the biosolid act as a soil conditioner with polymers. This makes soils retain water more easily while providing nutrients to plants.

Farmer spreading biosolids on crops

How do we choose which polymers we use?

We consider many factors when choosing and using polymers. Polymers need to meet requirements such as functionality, cost, health and environmental impacts.

When choosing a polymer, we consider its physical and chemical properties, like solubility, charge, biodegradability and strength. These properties change depending on the monomers that make up the polymers and the structures they form.

We choose polymers and their dosage at each plant. Some features we consider are:

Qualities of the wastewater or solids

- How much and what type of solids is in the water?
- Are there other substances that could interfere or need to be removed?

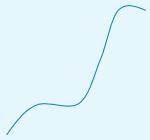
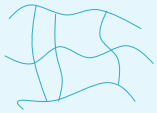
End use of the recycled water or solids

- Is the recycled water going to be used for irrigation, industry or at homes?
- How are the biosolids going to be applied in mine rehabilitation, crops or pastures?

Infrastructure and machinery

- Is the product going through a filter, a tank for sedimentation, a press or centrifuge?
- How are we going to get the polymer powder into a solution?
- How are we going to combine the polymer solution with the water or solids?

General characteristics of polymers we use

Structure	Properties
Linear 	Lower dosage, better mixing Low strength, smaller floc Comes in a range of molecular weights
Branched 	Intermediary between linear and cross-linked
Cross-linked 	Higher dosage, poor mixing Higher strength, larger floc Less degradable Greater drainage

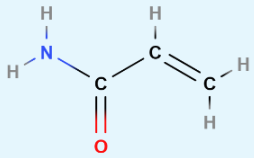
Why do we choose polyacrylamides?

We choose to use polyacrylamides in both water and solids recycling because of their versatility. Polyacrylamides can be modified by co-polymerisation (the addition of other monomers).

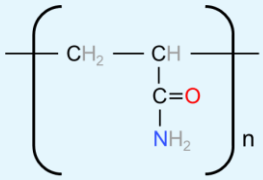
Chemical structure of polyacrylamides

Structural formula

Acrylamide



Polyacrylamide



n = number of repeats

We generally use cationic polyacrylamides that have high numbers of positively charged sites to attract negatively charged organic particles. Anionic polyacrylamide has negatively charged sites used to attract positively charged mineral particles.

Did you know?

Acrylamide can be chained together (polymerised) to form different polyacrylamide structures. These can reach high molecular weights (g/mol) in the millions!

Cross-linked and branched polyacrylamides are another variant. These are formed with chemical bonds that link one polymer chain to another. These are used to form stronger and drainable flocs commonly used for biosolid production.

Want to know more?

Water recycling

http://www.sydneywater.com.au/SW/education/Wastewater-recycling/Water-recycling/index.htm

Solids recycling

http://www.sydneywater.com.au/SW/education/Wastewater-recycling/Solids-recycling/index.htm

Book a tour

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