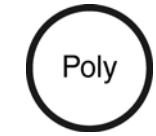
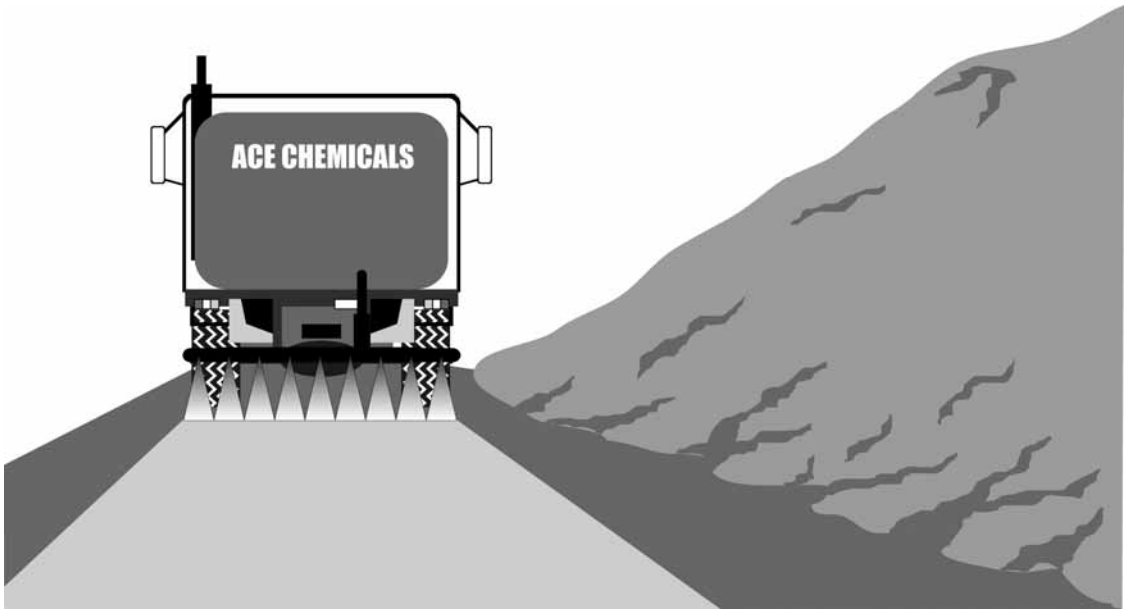
Polyacrylamide

EROSION CONTROL TECHNIQUE

Revegetation		Temperate Climates	✓	Short-Term	✓
Non Vegetation	✓	Wet Tropics	✓	Long-Term	
Weed Control		Semi-Arid Zones	✓	Permanent	

Symbol





Key Principles

1. Polyacrylamide (PAM) **must** only be used under strict environmental controls specified by suitably trained and experiences personnel.
2. If rainfall is possible, PAMs should not be the only cover material or surface stabiliser applied to the treated area.
3. PAMs must not be used on surfaces that drain directly to a water body (excluding sediment traps/basins). Stormwater runoff from treated areas **must** pass through a sediment basin (or other appropriate control) before leaving the site or entering any permanent water body (e.g. watercourse or lake).
4. Only the anionic form of polyacrylamide PAM shall be used.

Design Information

Polyacrylamide (PAM) may be applied in dissolved form with water (preferred), or applied as a dry, granular or powder. PAMs are high soluble, but dissolve very slowly, thus dry granular PAM should be dissolved in clean water several hours before usage, or overnight.

Typical application rate for **soil stabilisation** is 0.56kg/ha, diluted 0.060kg per 1000 litres of water. Anionic PAM, in pure form, shall have no more than 0.05% acrylic monomer by weight. To achieve this requirement, the application rate for PAM, in its pure form, on slopes and channels, shall not exceed 224kg/ha (Wisconsin DoT specification).

Typical application rate as a **mulch tackifier**, should not exceed 0.06 to 0.12kg per 1000 litres of water in a hydromulch, or 0.56kg/ha unless specifically recommended by the manufacturer.

When used as a soil stabiliser, the service life is defined by the ability of the treated surface to achieve a minimum cover factor (C) of 0.50 as defined in the Revised Universal Soil Loss Equation (RUSLE).

Polyacrylamide is a polymer formed from acrylamide sub-units that can also be readily cross-linked. Acrylamide needs to be handled using best laboratory practice (such as wearing appropriate gloves, lab coat etc. and having safe systems of work) to avoid poisonous exposure since it is a neurotoxin (nerve toxin). Polyacrylamide is not toxic, but unpolymerised acrylamide can be present in the polymerised acrylamide. Therefore it is recommended to handle it with caution. In the cross-linked form, it is highly water-absorbent, forming a soft gel used in such applications as the manufacturing soft contact lenses. In the straight-chain form, it is also used as a thickener and suspending agent.

One of the largest uses for polyacrylamide is flocculate or coagulate solids in a liquid. This process applies to water treatment, and processes like paper making. Most polyacrylamide is supplied in a liquid form. The liquid is sub-categorised as solution and emulsion polymer. Even though these products are often called 'polyacrylamide', many are actually copolymers of acrylamide and one or more other chemical species. The main consequence of this is to give the 'modified' polymer some ionic character.

The anionic form of polyacrylamide is frequently used as a soil conditioner on farm land and construction sites for erosion control, in order to protect the water quality of nearby rivers and streams. The cationic PAM is considered toxic.

Polyacrylamides are also used within water treatment industry. Trivalent metal salts like ferric chloride and aluminium chloride are bridged by the long polymer chains of polyacrylamide. This results in significant enhancement of the flocculation rate. This allows water treatment plants to greatly improve the removal of total organic content (TOC) from raw water

Some research indicates that polyacrylamide can degrade under normal environmental conditions, releasing acrylamide, a known nerve toxin. Early research indicated that polyacrylamide had the potential to host a nerve toxin, however recent research appears to contradict this outcome. In any case, the use of polyacrylamide required environmental investigation with regard to its potential environmental impact, and **must** only be used under strict environmental controls specified by suitably trained and experiences personnel.

Description

Polyacrylamide (PAM) is a polymer-based chemical surface stabiliser used for erosion control, chemical flocculation, and as a soil binder.

Only anionic products are used. Cationic Polyacrylamide should not be used.

Purpose

PAMs can be used as a means of controlling soil erosion on disturbed soils, as a mulch tackifier, and as a chemical flocculant for sediment basins.

PAMs increase the soil's available pore volume, thus increasing rainwater infiltration and reducing runoff.

Limitations

PAMs must not be directly applied to water, or allowed to enter a water body (excluding sediment traps/basins).

PAMs must not be used on surfaces that drain directly to a water body (excluding sediment traps/basins).

The effectiveness of PAMs is reduced if applied to a saturated soil surface.

Special Requirements

PAM and PAM mixtures/additives **must** be non-combustible and environmentally compatible, harmless to local fish, wildlife and plants.

Stormwater runoff from treated areas **must** pass through a sediment basin (or other appropriate control) before leaving the site or entering any permanent water body (e.g. watercourse or lake).

Supplementary erosion and sediment control practices within the treated area must be optimised and of a high standard.

If rainfall is possible, PAMs should not be the only cover material or surface stabiliser applied to the treated area.

PAMs can be applied to wet soils, but dry soil application is preferred.

Granular polyacrylamide must be stored out of the sun while not in use.

PAM, combined with water, is very slipper and can represent a safety hazard.

Location

PAM are best used on disturbed areas that drain to a sediment basin.

PAMs can be applied to the following areas:

- rough graded soils during an extended period of non activity (e.g. site shutdown);
- exposed soil surfaces prior to final stabilisation;
- temporary construction roads;
- compacted soil road base;
- soil stockpiles;
- disturbed soil surfaces that will be mulched.

Materials

- Choice of polyacrylamide should be based on the most environmentally safe, anionic product available. Cationic polyacrylamide shall not be used.
- Polyacrylamide used for erosion and sediment control shall be water soluble, linear, or non-cross linked.
- Granular polyacrylamide must be stored out of the sun while not in use.

Application

1. Refer to approved plans for location, extent, and application details. If there are questions or problems with the location, extent, or method of application contact the engineer or responsible on-site officer for assistance.
2. Polyacrylamide, combined with water, is very slipper and can represent a safety hazard. Appropriate manage-ment of any safety hazard must be achieved.
3. Ensure all polyacrylamide are used for purposes and at application rates in accordance with manufacturer's specifications and recommendations.
4. Polyacrylamide must not be added to water discharging directly from the site.
5. Pre-dissolve the dry, granular polyacrylamide into a concentrated solution overnight or several hours before usage.
6. Prior to application, ensure supplementary erosion and sediment control practices comply with best practice.
7. Pre-fill a tank approximately 1/8 full with water prior to input of the pre-prepared, concentrated polyacrylamide solution. Continue to fill the tank with the required water volume. The water must have low turbidity in the range of 20 NTU or less.
8. Apply the mixture until the soil surface is uniformly and completely wetted.
9. All reasonable efforts should be taken to apply polyacrylamide solution to the soil while the soil is in a 'dry' condition.
10. During application, all reasonable efforts must be taken to avoid spray onto roads, pathways, drainage channels not intended for application, and existing vegetation

Maintenance

1. Inspect the treated surface prior to forecast rain, daily during extended periods of rainfall, after significant runoff producing storms or otherwise at fortnightly intervals.
2. Reapply within 48 hours after the treated areas have been disturbed by earthmoving machinery if erosion control is required.
3. Reapply as necessary on damaged areas.
4. Reapplication is generally not required unless the treated area is disturbed, a period of 60-days has passed, or unless acceptable turbidity levels are exceeded. If the treated area has been mulched, then reapplication may not be required for several months.