

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

ANIONIC POLYACRYLAMIDE (PAM) APPLICATION

(Ac.)

CODE 450

DEFINITION

Application of water-soluble Anionic Polyacrylamide (PAM) to meet a resource concern.

PURPOSE

This practice may be applied as part of a resource management system to achieve one or more of the following purposes:

- Reduce soil erosion by water or wind.
- Improve water quality.
- Improve air quality by reducing dust emissions.
- Reduce energy use.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to:

- Irrigated lands susceptible to irrigation-induced erosion where the sodium adsorption ratio (SAR) of irrigation water is less than 15.
- Critical areas where the timely establishment of vegetation may not be feasible or where vegetative cover is absent or inadequate.
- Areas where plant residues are inadequate to protect the soil surface from wind or water erosion.
- Sites where disturbance activities prevent establishment or maintenance of a cover crop.

This practice does not apply to soils with peat or organic matter surface horizons. This practice does not apply to the application of PAM to flowing, non-irrigation waters.

CRITERIA

General Criteria Applicable To All Purposes

All application rates listed in this standard are based on active ingredient of PAM in the product. Various formulations of PAM products should be applied according to the actual amount of PAM contained in the product.

The PAM shall:

- Be used only if officially labeled for the intended use (e.g. labeled for irrigation erosion control or wind erosion control).
- Be of the anionic type meeting acrylamide monomer limits of ≤ 0.05 percent.
- Have a charge density of 10 to 55 percent, by weight.
- Have a molecular weight of 6 to 24 Mg/mole.
- Be designated as "water soluble", "linear", or "non-cross linked."
- Be mixed and/or applied in accordance with Occupational Safety and Health Administration (OSHA) Material Safety Data Sheet requirements and the manufacturer's recommendations.

Additional Criteria Applicable to Reduce Soil Erosion by Water or Wind

Surface Irrigation. PAM shall be used during the first irrigation and after any soil disturbance (for example cultivation). PAM shall be used during later irrigations if soil movement is observed. Pre-irrigation is considered irrigation.

Add mixed concentrations of PAM to irrigation water only during the advance phase of a surface irrigation. The advance phase shall be considered the time irrigation starts until water has advanced to the end of the field. In some

cases PAM may be shut off prior to completion of the advance phase so long as no visible erosion occurs.

Place dry or patch treatments of PAM over an area of the first 5 feet of furrow. A starting application rate of 1 ounce per 1000 feet of furrow length is recommended. Field adjustment (increase or decrease) to this application rate is required. The rate should be adjusted until no visible erosion occurs.

The resulting concentration of PAM in irrigation water shall not exceed 10 ppm of pure form polyacrylamide, applied on a total product basis.

Sprinkler Irrigation. The maximum application rate of polyacrylamide active ingredient shall not exceed 4 pounds per acre per single application event.

Totally mix and liquefy PAM mixtures prior to injection into the irrigation system.

Inject only on the downstream side of all screens and filters.

Conform to all federal and state chemigation standards.

Critical Areas. The maximum application rate of pure form polyacrylamide shall not exceed 200 pounds per acre per year.

Insure uniform application coverage to the target area, minimizing drift to non-target areas.

Additional Criteria Applicable to Reduce Energy Use

Provide analysis to demonstrate reduction of energy use from practice implementation.

Reduction of energy use is calculated as average annual or seasonal energy reduction compared to previous operating conditions.

CONSIDERATIONS

The following relate to the application of PAM that may enhance or avoid problems with the practice, but are not required to insure its basic conservation function.

General

PAM application rates may need to be adjusted based on soil properties, slope, and type of resource concern targeted.

Where reasonably possible, tailwater or runoff containing PAM should be stored for re-use or recycled on other land areas.

Use of PAM in combination with other conservation and Best Management Practices may improve erosion control.

The use of PAM may increase downstream or offsite deposition of sediment.

Irrigation Induced Erosion Considerations

Other conservation treatments such as land leveling, irrigation water management, reduced tillage, reservoir tillage, crop rotations, etc., should be used in conjunction with this practice to control irrigation-induced erosion.

On fine to medium textured soils, PAM may result in an increase in surface irrigation infiltration of up to 60 percent, with 15 percent being typical on medium textured soils. Infiltration increases can be expected to diminish or be eliminated in succeeding treated irrigations, if there is no soil disturbance between applications. Use of higher than recommended application rates will usually decrease infiltration rates, rather than increase them. PAM use on coarser textured soil is more likely to decrease infiltration.

To compensate for PAM changes in infiltration, adjustments in flow rates, set times, and tillage practices should be considered. Stream size should be monitored to insure there is no visible sign of erosion. If stream sizes are increased, cutback irrigation (reducing the stream size after advance is completed) should be considered to reduce runoff and maintain high irrigation efficiency, unless an irrigation reuse system is in place.

Reduction from maximum PAM rates and volumes should be considered, as long as no visible erosion occurs.

If irrigation water is high in sediment, application of PAM to the head ditch or lateral may cause excessive sedimentation within the ditch/lateral and loss of flow capacity. Consideration should be given to settling out the sediment in a settling pond with increased PAM application rates or by decreasing flocculation potential by applying smaller application rates (e.g. 5 ppm) while still controlling erosion.

Sprinkler systems will likely need multiple applications to achieve a significant erosion reduction.

For PAM injection systems, a check valve should be installed between the irrigation supply line and the injection system to prevent water from entering the injection system and/or PAM supply container.

Applications at the end of the season are discouraged, unless the field has been recently tilled.

Wind/Precipitation Erosion and Dust Emissions Considerations

Combining seed with the PAM mixture extends erosion protection beyond the life of the PAM material.

Safety and Health

Use proper personal protective equipment, e.g. gloves, masks, and other health and safety precautions in accordance with the label, industry, and other federal or state, and local chemigation rules and guidelines.

PAM dust can cause choking and difficulty in breathing if inhaled. Persons handling and mixing PAM shall use a dust mask of a type recommended by the manufacturer.

PAM solutions can cause floors, other surfaces, tools, etc. to become very slippery when wet.

Clean liquid PAM spills with dry absorbent material (sawdust, soil, cat litter, etc.) and sweep/collect dry PAM material without washing with water.

To prevent slick conditions, avoid sprinkling roadways when applying PAM.

PLANS AND SPECIFICATIONS

Specifications will be developed site specifically for each application. Specifications for this practice will be prepared for each field or treatment unit according to the criteria, considerations, and operation and maintenance described in this standard. Specifications shall be recorded using approved specification sheets, job sheets, narrative statements in the conservation plan, or other acceptable documentation.

OPERATION AND MAINTENANCE

An Operation and Maintenance Plan must be prepared for use by the landowner or operator responsible for PAM application. The plan shall provide specific instructions for PAM applications to:

- Reapply PAM to disturbed or tilled areas, including high traffic use areas.
- Monitor advance phases of the irrigation to assure applications are discontinued when runoff begins.
- Operate and maintain equipment to allow uniform application rates.
- Maintain screens and filtering facilities.
- Clean all PAM mixing and application equipment thoroughly with water to avoid the formation of PAM residues.
- For sprinkler and gated pipe systems, flush injection equipment (PAM injection pump, tubing, valves, etc.) with crop oil before and after injecting concentrated liquid PAM (30 to 50 percent active ingredient). Crop oil provides a buffer between PAM and water so non-flowing PAM does not contact water and form a gelatinous mass that can plug valves and tubing.
- For sprinkler and gate pipe injection, the PAM injection pump should be started after water is flowing in the sprinkler or gated pipe system. To flush PAM from sprinklers or gated pipe stop injection pump before the irrigation pump stops.

REFERENCES

The following references may provide useful guidance and information in the development and application polyacrylamide (PAM) for erosion control:

National Engineering Handbook, Part 652, Irrigation Guide

National Engineering Handbooks, Part 623, Section 15, Chapter 5.

Managing Irrigation – Induced Erosion and Infiltration with Polyacrylamide. Proceedings from the conference held at the College of Southern Idaho, May 6-8, 1996. University of Idaho Miscellaneous Publication No. 101-96.

ARS WEB site on PAM at Kimberly Idaho.
<http://kimberly.ars.usda.gov>

Aase, J.K., D.L. Bjorneberg, and R.E. Sojka. 1998. Sprinkler irrigation runoff and erosion control with polyacrylamide - laboratory tests. Soil Sci. Soc. Am. Journal. 62:1681-1687.

Lentz, R.D. and R.E. Sojka. 2000. Applying polymers to irrigation water: Evaluating

strategies for furrow erosion control. Trans. ASABE 43(6): 1561-1568.

Sojka, R.E., D.L. Bjorneberg, J.A. Entry, R.D. Lentz, and W.J. Orts. 2007. Polyacrylamide in agriculture and environmental land management. Advances in Agronomy 92:75-162.