

**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.

PURPOSES

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

Sprinkler irrigation with PAM is limited to irrigation in the pre-emergent stage of vegetation on all crops for human consumption. The effects and impacts of PAM application on emerged crops for human consumption are not known.

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 polyacrylamides 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 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 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.

Place dry or patch treatments of PAM over an area of the first 5 feet of furrow.

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. PAM shall not be applied to emerged seedlings on crops meant for human consumption. The effects and impacts of PAM application on emerged crops for human consumption are not known.

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.

Occasionally, particularly for use in sprinkler applications, mineral oils may be used to emulsify liquid PAM. Emulsions with a high mineral oil content may be of concern to water quality of receiving waters. Mineral oil PAM products with a higher PAM content (50%) can be used to reduce any potential toxicity to aquatic test organisms. To further minimize impacts to surface waters:

- consider conservation practices (such as 393 Filter Strip) that reduce the concentration of emulsified PAM product in the tailwater discharge prior to release off the field.
- provide sprinkler shields on any nozzles where the wetted area of the sprinkler or wind drift may affect surface waters.

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.

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

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

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 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 injection, the PAM injection pump should be started after water is flowing in the sprinkler system. To flush PAM from sprinklers stop injection pump before the irrigation pump stops.

REFERENCES

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.

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. Journ. 62:1681-1687.

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.