



Natural Resources Conservation Service
CONSERVATION PRACTICE STANDARD
ANIONIC POLYACRYLAMIDE (PAM) APPLICATION

Code 450

(Ac)

DEFINITION

Application of water-soluble anionic polyacrylamide (PAM) to meet a resource concern.

PURPOSE

This practice may be applied to achieve one or more of the following purposes:

- Reduce soil erosion by water or wind.
- Improve water quality.
- Improve soil surface infiltration rate and minimize soil crusting to allow for uniform plant growth.
- 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, nonirrigation 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 will—

- Be free of nonylphenol (NP) and nonylphenol ethoxylates (NPE), often used as surfactants.
- 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 applied in accordance with Occupational Safety and Health Administration (OSHA) Material Safety Data Sheet requirements and the manufacturer's recommendations.

NRCS reviews and periodically updates conservation practice standards. To obtain the current version of this standard, contact your Natural Resources Conservation Service [State office](#) or visit the [Field Office Technical Guide](#).
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- Be used with proper personal protective equipment (e.g., gloves, masks, and other health and safety precautions) in accordance with the label, industry, and other Federal, State, and local chemigation rules and guidelines.

Additional Criteria Applicable to Reduce Soil Erosion by Water or Wind

Surface Irrigation. Use PAM during the first irrigation and after any soil disturbance (for example, cultivation). Apply PAM during later irrigations if soil movement is observed. Preirrigation is considered irrigation.

Add mixed concentrations of PAM to irrigation water only during the advance phase of a surface irrigation. The advance phase will 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 must not exceed 10 ppm of pure form polyacrylamide, applied on a total product basis.

Sprinkler Irrigation. The maximum application rate of polyacrylamide active ingredient must 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 must not exceed 200 pounds per acre, per year.

Ensure uniform application coverage to the target area, minimizing drift to nontarget areas.

Additional Criteria Applicable to Improve Soil Infiltration Rate and Minimize Crusting

The maximum application rate of polyacrylamide active ingredient must 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.

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

Use of the following considerations may enhance or avoid problems with the practice, but are not required to ensure 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 reuse or recycled on other land areas.

Use of PAM in combination with other conservation and best management practices may improve erosion control.

If water containing PAM leaves the field and mixes with a sediment laden stream of water, it may increase downstream or offsite deposition of sediment.

PAM products without PE and NPE are safe for aquatic organisms at the concentrations recommended in this standard. To minimize residual sediment and PAM leaving the field, consider applying herbaceous buffer or tailwater recovery practices between the treated field and any receiving water bodies. See Kerr et al., 2014 and Weston et al., 2009 for further detail regarding impact to aquatic organisms.

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. 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 will 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 nonflowing 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

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- Zejun, T., L. Tingwu, Z. Qingwen, and Z. Jun, 2002. The Sealing Process and Crust Formation at Soil Surface under the Impacts of Raindrops and Polyacrylamide 12th ISCO Conference, Beijing China.