

Application Guide



Tessenderlo KERLEY

PRODUCT ANALYSIS

Nitrogen (N).....	20%
(20% Ammoniacal Nitrogen)	
Combined Sulfur (S).....	40%

Derived From: Ammonium Polysulfide

Density:

Density, lbs/gallon @ 68°F	9.4
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What is APS-600?

APS-600 is a dark red solution containing 20% ammoniacal nitrogen (equivalent to about 24.5% anhydrous ammonia [NH₃]) and 40% sulfur as polysulfide). APS-600 weighs approximately 9.4 lbs. per gallon.

APS-600 has the highest sulfur content of any chemically combined nitrogen-sulfur solution available to the fertilizer industry and the grower. The chemical formula may be represented by (NH₄)₂S_x.

Why does APS-600 contribute to a better crop?

1. Sulfur is a necessary plant food. APS-600 is rich in fast acting sulfur. A leading agriculturist recently stated: "Sulfur fertilization is increasing yields of more crops on more soils each year. A few years ago sulfur fertilizers were recommended only in the western U.S. and in sandy soils in the more humid areas."

Now sulfur responses have been demonstrated in many additional geographic areas. This rapid recognition of sulfur deficiencies may be attributed to: (a) accelerated depletion of soil sulfur reserves through crop removal, erosion and leaching losses, (b) greatly increased use of nitrogen fertilizer, (c) the shift to high analysis fertilizers, and (d) lowered atmospheric sulfur levels due to "Clean Air" legislation.

2. Plants digest nutrients after those nutrients have been made soluble by "digestive acids". APS-600 not only provides important amounts of sulfur and nitrogen as plant nutrients, but the reactive form of sulfur in APS-600 also provides a strong "digestive acid" helping the assimilation of needed nutrient elements such as phosphorus potassium, iron, zinc, manganese and calcium.
3. Irrigation water containing APS-600 will penetrate much deeper into the root zone when applied to tight or so-called "slick" soils, and its effect in improving soil penetration may be noticed also in subsequent irrigations.
4. Subbing up across the beds in a field.
5. Applications of APS-600 have a softening effect upon "tight" soils and such an effect may be evident by improved soil physical condition.

6. APS-600 is a valuable source of nitrogen as it contains the non-leaching ammoniacal form of nitrogen.
7. One of the most important reason for using APS-600 is revealed by the following quotation from *California Agriculture* by W.E. Martin, in an article entitled, "Sulfur Deficiency Widespread."

"Materials supplying sulfur alone may have no effect in cases of secondary sulfur deficiency unless nitrogen is also applied. A straight nitrogen material may give limited improvement with plants being a pale green."

Another important reason for using APS-600 is its effect on correcting alkalinity and sodicity problems in these soil types.

APS-600 contains both of these important nutrients in chemical combination (not just a mixture) so that they remain together in combination upon deep penetration or when otherwise moved by soil moisture in the root zone.

PLANT FOOD AND EFFECT OF MINOR ELEMENTS

The outstanding results obtained from the use of APS-600 is due to its high nitrogen and sulfur content. APS-600 provides the beneficial action of sulfur in correcting alkali soils, as well as an oxidation reaction on unavailable plant nutrients such as phosphorus, potassium, magnesium and minor elements in the soil. APS-600 may make these nutrients available in sufficient quantities to supply the needs of the growing plant.

Sulfur serves as one of the important, essential plant nutrients and when applied to a sulfur-deficient soil, its use will result in increased crop yield and crop quality.

GENERAL INFORMATION

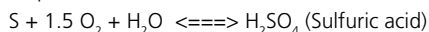
APS-600 is a dark red liquid containing 20% nitrogen in the ammoniacal form and 40% polysulfide sulfur. The sulfur particles in APS-600 are between 0.002 and 0.4 microns in diameter. This small size allows the bacteria in the soil to quickly oxidize the sulfur to sulfuric acid, generally within 2 to 3 weeks under normal field conditions.

APS-600 was developed for application through high volume sprinklers (hand lines or lateral move) and may also be applied in flood or furrow irrigation.

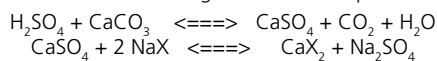
APS-600 works in several different ways

- 1) Conditions the soil
- 2) Stretches water by reducing salts
- 3) Improves water penetration
- 4) Reduces surface crusting in salt affected soils
- 5) Increase nutrient response, directly and indirectly
- 6) Makes available greater quantities of phosphate and micronutrients that have become "tied up" due to high level of CaCO₃ in the soil
- 7) An excellent source of nitrogen and sulfur, essential plant nutrients

The generally accepted formula for oxidation of sulfur in soils is:



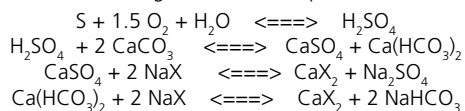
The following chemical equation shows the generally accepted manner in which H₂SO₄ reacts in alkali soil for exchangeable sodium replacement:



The sulfate ion neutralizes the charge of the sodium ions by forming sodium sulfate. Irrigation water can now leach the sodium below the root zone.

Under some conditions, such as injecting through irrigation systems, APS-600 may replace considerably more sodium than some other soil amendments.

The following chemical equation shows the manner in which APS-600 sulfur reacts in alkali soil for exchangeable sodium replacement:



With APS-600, Ca(HCO₃)₂ as well as CaSO₄ may be available for reaction with exchangeable sodium. The oxidation of ammonium to nitrate produces H⁺ ions that would also be available to replace even more sodium than shown.

PRECAUTIONARY STATEMENTS (Handling)

Avoid contact with the eyes. Chemical goggles and a full face shield must be worn. Do not wear contact lenses when using this material. Avoid contact with the skin. Wear appropriate protective equipment to protect the skin, such as rubber or plastic aprons, gloves and boots. May cause serious gastro-intestinal distress if swallowed.

STATEMENT OF PRACTICAL TREATMENT

Eye Contact: Immediately flush with large quantities of water for 15 minutes. Hold eyelids apart during irrigation to ensure thorough flushing of the entire area of the eye and lid with water. Obtain immediate medical attention.

Ingestion: Do not induce vomiting. If victim is conscious, immediately give large quantities of water. If vomiting does occur, repeat fluid administration. Obtain immediate medical attention.

Skin Contact: Immediately flush with large quantities of water. Remove contaminated clothing under shower. Obtain immediate medical attention.

Inhalation: Wear protective respiratory equipment while removing victim from contaminated area. If breathing is labored, administer oxygen. If breathing has ceased, clear airway and start mouth-to-mouth resuscitation. Obtain immediate medical attention.

ENVIRONMENTAL HAZARDS

Keep out of lakes, ponds, rivers, and streams. Do not contaminate ground water or surface water by cleaning equipment or disposal of waste.

STORAGE AND DISPOSAL – Do not contaminate water, food, or feed by storage or disposal. Dilutions with water or UAN should not be stored for more than 2 days. Do not store near acids or other acidic material.

APPLICATION

APS-600, when properly handled, is easy and safe to apply. In irrigated areas it may be applied via the irrigation water. In the irrigation water, it will penetrate and give its beneficial action to the root zone. Or, APS-600 may be injected in the soil similar to the injection of other liquid fertilizers. General application rates may vary from 10 to 15 gallons per acre.

APS-600 when diluted with water to 15% or lower nitrogen assay, may be applied directly to the surface of the soil by spray equipment. *This should be done prior to planting, as concentrated material may injure the foliage of most crops.*

APS-600 may be blended with other liquids such as water, anhydrous ammonia, aqua ammonia, urea solutions or UAN. APS-600 may be blended in recommended proportions with other plant nutrient solutions to achieve the desired nitrogen-to-sulfur ratio to satisfy the needs of the crop. A recommended blend of UAN solution, 32-0-0 and APS-600, would result in a 29-0-0-10S analysis. *APS-600 is not compatible with ammonium polyphosphate (10-34-0 and 11-37-0).*

In absence of specific recommendations, a jar test is recommended.

The amount of APS-600 required per acre or hectare may vary due to soil conditions and crop requirements. Rates may vary depending on whether APS-600 is to be used to correct soil alkalinity, solubilizing other plant nutrients or supplying nitrogen-sulfur as needed plant nutrients. Crop response may be from a combination of the above.

Where soils are sulfur deficient, most crops will exhibit a good response with the application of ten to twenty-five pounds of sulfur. In some cases, forty pounds per acre per year of sulfur may be required, depending on soil testing recommendations. In other, cases, it may take several years of such applications before a visual difference in crop quality may be noted. It has been found that certain crops exhibit good response with one pre-plant application. However, good responses have been obtained from a number of smaller "spoon feeding" applications.

EQUIPMENT

Standard injection applicators are satisfactory for the application of APS-600. Equipment should not be left standing for prolonged periods after using a APS-600 blend without first flushing and cleaning out the equipment.

APS-600 may be stored in mild steel, fiberglass, polyolefin and stainless steel containers. It is recommended that APS-600 storage tanks have a 2-4" layer of *non-petroleum base oils*, such as crop oil, soy bean oil or cotton seed oil, on top of the solution. This will help seal the ammonia vapors contained in the tank and will help in eliminating sulfur fall out.

As with all fertilizers containing nitrogen, brass and other copper alloys must not be used in contact with APS-600 due to excessive corrosion.

MIXING WITH AQUA AMMONIA

APS-600 may be mixed with 20% N aqua ammonia in any proportion. Vapor escapes, however, should not be allowed, as it not only represents a loss of nitrogen, but allows the formation of elemental sulfur which will precipitate out. *For long term storage, especially at low temperatures, APS-600 should be diluted with aqua ammonia (at least one gallon of aqua for every three gallons of APS-600).*

How does APS-600 add Up ?

1. Excellent source of nitrogen and sulfur.
2. Profitable and economical to use.
3. May be applied: pre-plant, water run, sprinkler irrigation, soil injected, or sprayed on bare ground and incorporated into the soil.
4. Increases subbing up of soil moisture.
5. Increases water penetration in the soil.
6. The best soil amendment and sulfur source in the market today!
7. APS-600 has the ability to displace more Sodium (Na) than any other product currently available.

STORING AND HANDLING APS-600

The polysulfide S in APS-600 is in a ratio of 2.3:1 (28% elemental and 12% sulfide sulfur). This ratio allows for the application of APS-600 through sprinkler irrigation. APS-600, if not adequately contained may lose ammonia causing the precipitation of sulfur in the bottom of the tank. Listed below are several steps to eliminate this problem.

1. APS-600 is affected by heat. As temperature increases the vapor pressure increases proportionately causing a loss of ammonia. Painting tanks white to increase the reflectance will reduce the heat build up, thus reducing the amount of ammonia lost to the atmosphere.
2. Plumbing from the storage tank to the load out should be kept at a minimum length and painted white to reduce heat build up. A flush-out system should be plumbed into the load-out line so that product may be flushed from the line (use water or aqua ammonia) at the end of the day.
3. If material is left in the plumbing for a prolonged period of time with hoses capped or valves closed, pump seals may be damaged due to hydrostatic pressure.
4. Do not flush material back into the tank as this could cause dilution of material in the storage tank.
5. Use a non-petroleum based oil such as cotton seed, soybean oil or crop oil, on the surface of the product to prevent air contact. The non-petroleum based layer should be 2-4 inches thick and will provide protection for one season. In cooler climates, tanks should be cleaned out, if possible, in the fall before the winter season.
6. A U-vent should be used on storage tanks to reduce the amount of ammonia loss. Wind blowing across a straight vent will slightly reduce the atmospheric pressure in the tank increasing the likely hood of ammonia loss from the product. A U-Vent will help prevent this from happening.
7. Use teflon tape on all threaded pipe fittings.
8. Use a 3-5% hydrogen peroxide solution (medicinal strength) to spray on minor spills for odor control.

DO NOT

1. Do not leave straight-up vents or manholes open.
2. Do not leave hoses open to air unless they have been rinsed.
3. Do not mix with acids or other non-compatible products.
4. Do not let nitrogen fall below 19%

TRANSPORTATION

When dispatching trucks to transport a load of APS-600, request clean trucks. *APS-600 does not mix with other liquid fertilizer products, such as ammonium polyphosphate fertilizers (10-34-0 and 11-37-0), potassium containing products, or micronutrients.*

Customer APS-600 Facility Check List

1. Are the storage tanks a light color?
2. What type of APS-600 storage? Aluminum, Stainless steel, Carbon steel, Fiberglass, Poly?
3. Is the APS-600 storage properly vented?
4. Does the APS-600 storage have a light non-petroleum oil floating as a buffer?
5. Are the hoses for loading out the field equipment capped?
6. Is the storage tank plumbing hooked up separate from any other product to avoid contamination with the APS-600?
7. Are the APS-600, Aqua Ammonia, and NH₃ field equipment in good condition?
8. Does the customer pump unused APS-600 and/or Aqua-Ammonia back into the main storage tank?
9. Does the customer have check valves on the field tanks to keep other products from coming in contact with the APS-600?
10. Is the APS-600 storage tank set up so that is a spill does occur, there is sufficient containment to contain the product?

GENERAL APPLICATION AND USE RECOMMENDATIONS

APS-600 was designed for application through high volume sprinkler systems. *Injecting APS-600 into drop systems is NOT recommended, due to possible plugging.* SEE INJECTION RATE.

SOIL INJECTION

APS-600 is an excellent source of sulfur for plant nutrition and soil amendment. APS-600 may be injected into the soil in combination with anhydrous ammonia, UAN, and aqua ammonia to meet the sulfur requirements of a crop. Each gallon contains 3.8 pounds of sulfur. Application rates are dependent on the crop, soil type, and placement. For best results, follow university guidelines for sulfur nutrition on crops for your area and soil test recommendations.

FERTIGATION

APS-600 should be injected at the rate of 2 to 4 gallons per minute per 1000 gallons of water. A general guideline is a minimum of 1.0 gallon of APS-600 per 500 gallons of water. A well that pumps 750 gallons per minute, the minimum rate of injection would be 1.5 gallons of APS-600 per minute. *Dilution of APS-600 below the recommended rates can cause the formation of elemental sulfur which may plug nozzles.* Please refer to the table below.

Rate of Injection

Gallons H ₂ O Per Minute	Gallons APS-600 Per Minute
500	1.0
750	1.5
1000	2.0
1250	2.5
1500	3.0
2000	4.0

FAILURE TO FOLLOW THESE GUIDELINES MAY RESULT IN PLUGGING OF SPRINKLER NOZZLES.

PREPLANT SPRINKLER APPLICATION

Apply 15 to 30 gallons per acre of APS-600 to beds at least seven to ten days before planting. Apply enough water during the germination irrigation to leach salt well below the seed zone.

POST EMERGENCE SPRINKLER APPLICATION

SEE CAUTIONS BEFORE APPLYING.

APS-600 may be injected over established row crops under certain conditions. When the crop has reached the third leaf stage, inject APS-600 according to the previously described instructions using the minimum injection rate. Sprinklers must be operating properly before starting the injection. After injecting APS-600, allow sprinklers to run at least 1-1/2 to 2 hours to wash off any residual product that may be on the leaves. Do Not inject APS-600 over a crop when temperatures are above 90° F and the relative humidity is below 25%.

SEE INJECTION RATE BEFORE APPLYING

Carrots, Garlic, Onions: Apply 5 to 10 gallons per acre of APS-600 after plants are 5 inches tall, one to two times per season or as needed. Apply treatments at least 2 weeks apart.

Sugar Beets: Apply 5 to 10 gallons of APS-600 per acre beginning at third leaf stage. **DO NOT** apply after crop has reached 30% canopy.

Cotton: Apply 5 to 10 gallons of APS-600 per acre beginning at third leaf stage. **DO NOT** apply after crop is 12 inches in height.

Wheat: Apply 5 to 10 gallons per acre of APS-600 beginning at third leaf stage. **DO NOT** apply after crop canopy has reached 75%.

Potatoes: Apply 5 to 10 gallons of APS-600 per acre beginning at third leaf stage. **DO NOT** apply after crop has reached 40% canopy.

Alfalfa: Apply 10 to 15 gallons per acre of APS-600 immediately after a cutting or when crop is still dormant. Apply one to two times per year or as needed.

Corn: Apply 5 to 10 gallons per acre of APS-600 at third leaf stage. **DO NOT** apply after crop is 12 to 14 inches in height.

Turf: Apply 5 to 10 gallons per acre of APS-600, one to two times per year. Apply treatments at least 4 weeks apart.

Almonds: Apply 10 to 15 gallons per acre of APS-600, one to two times per season. **DO NOT** apply within 30 days of a dormant oil spray.

For crops not listed above consult with your Tessengerlo KERLEY sales representative.

FLOOD AND FURROW IRRIGATION

Consideration should be given to the amount of nitrogen in APS-600 and timing of applications. Each gallon of APS-600 contains 1.9 pounds of nitrogen readily available to the crop.

Best Management Practices applications should be made so the crop may utilize the available nitrogen, either just before planting and/or during the growing season. To improve water penetration and remove salts on heavy clay soils, the maximum recommended rate is normally required.

Alfalfa: Germination water – apply 5 gallons per acre to reduce salts in the seed zone. After cutting, apply 10 to 15 gallons per acre before regrowth has resumed.

Row crops and vegetable crops:

Pre-plant irrigation – apply 10 to 20 gallons per acre in the irrigation water.

At planting – apply 5 to 15 gallons per acre in the first irrigation to improve subbing across the beds.

During the growing season – apply 5 to 15 gallons per acre per treatment.

Trees and vines: Apply 10 to 20 gallons per acre per treatment during the growing season to improve water penetration and reduce salts. Apply when the crop can best utilize nitrogen. Fall treatment – apply APS-600 after harvest (before dormancy). APS-600 provides nitrogen for next seasons early growth, enhances water penetration in dry, compacted soils and with the help of winter rains improves the leaching of salts.

BROADCAST SPRAY

APS-600 may be sprayed as a broadcast treatment to bare soil. For best results and ease of handling, dilute with water (2 parts water to 1 part APS-600) to make a 33% solution of APS-600, use immediately. Irrigate or incorporate into the soil after application.

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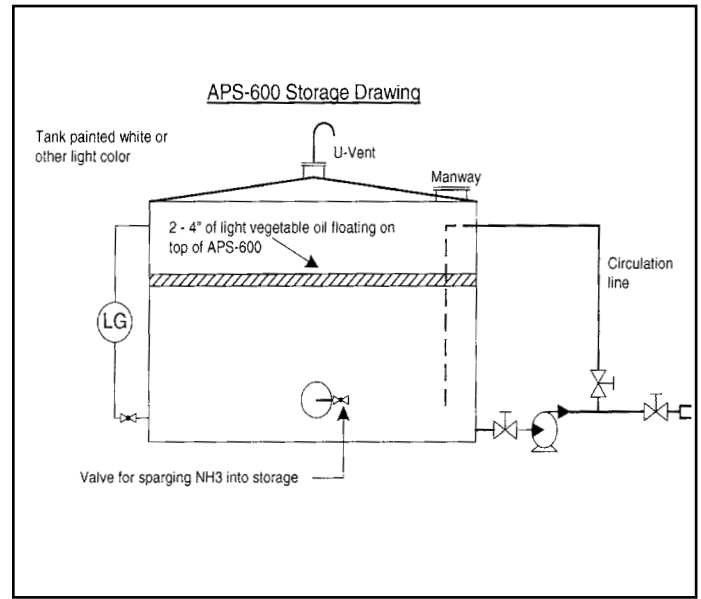
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CAUTION (APPLICATION)

Clean equipment after use.

DO NOT apply APS-600 directly on germinating seeds or to foliage of plants. APS-600 may damage germination and/or burn foliage.

DO NOT use **BRASS** and **COPPER** containing alloys in fittings or nozzles when handling APS-600.



CAUTION (MIXING)

DO NOT mix with acids or other acidic material, the resulting reaction may produce toxic hydrogen sulfide.

THIS IS A SOIL TREATMENT AND NOT A FOLIAR FERTILIZER.
FAILURE TO FOLLOW ALL GUIDELINES CAN RESULT IN CROP DAMAGE.

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