

Fluid Fertilizers



Fluid fertilizers are popular because of the ease of handling and use. Movement is by pump, and they usually require less labor to handle. Some pesticides can be injected into the fluid, saving trips across the field. Fertilizers custom blended to specifications are available.

Properly applied, fluid fertilizers are no more or less efficient than dry fertilizers. Most fluid fertilizers contain the same basic ingredients as dry fertilizers. The only difference is that fluid fertilizers are dissolved in water, and dry fertilizers are not. The efficiency of fluid fertilizers is determined by the way they are applied.

Types of Fluid Fertilizers

The major types of fluid fertilizers are suspension fertilizers and solution fertilizers. Solution fertilizers are dissolved completely in water. Suspension fertilizers are partially dissolved in water, but some of the nutrients, particularly potash, are suspended in the water in the same way mud is suspended in water. Suspension agents (typically a clay material) are used in suspension fertilizers to keep the fertilizer material from settling out. True solution fertilizers can be stored as long as the temperature stays above freezing. Suspension fertilizers should be applied the same day they are blended.

Common Solution Fertilizers

Urea-ammonium nitrate solutions (UAN) are urea and ammonium nitrate dissolved in water. Because of the urea content, to avoid volatilization losses of nitrogen (N) to the atmosphere, you must follow the same constraints in managing UAN as you do for dry urea. Avoid surface applications in hot, dry weather. When used in reduced tillage, larger droplets help slow losses by volatilization.

Thirty-two percent UAN (32-0-0) weighs 11.06 pounds per gallon and salts out (solids separate from the liquid) at 32°F. Twenty-eight percent (28-0-0-5) contains 5 percent sulfur in addition to the nitrogen. You can use it where you expect a response to sulfur, such as on sandy textured, low organic matter soils. It is manufactured by adding ammonium thiosulfate to UAN. It weighs 11.1 pounds per gallon and has a salting-out temperature of about 0°F.

Ammonium polyphosphate dissolved in water (10-34-0 and 11-37-0) is used as a starter fertilizer in row crop production. Weights and salting-out temperatures are available from vendors. Other solution fertilizer grades are available.

Solution fertilizers are low in potash because no more than 11 percent potash will go into solution, and 9 percent is more practical to manufacture. Most fluid fertilizers containing greater than 9 percent potash are suspension fertilizers.



Common Suspension Fertilizers

Suspension fertilizers hold the fertilizer in a suspension, much like mud in water. Suspending agents, such as attapulgitic clay, prevent the fertilizer material from settling out.

More potash may be in a suspension fertilizer because it does not have to go into solution to stay dispersed in the liquid. Suspensions settle out if not used soon after blending. There is no standard analysis, because almost any grade of suspension fertilizer can be blended.

Some contact herbicides, such as paraquat, are deactivated by binding to negatively charged clays. If the application contains paraquat, you must use suspending agents without negative charges. These suspending agents (for example, xanthum gum products) are usually more expensive than the clays otherwise used in formulating fertilizers.

Fluid Fertilizer Application Methods

Fluid fertilizers are usually applied by broadcast spray, dribble, knife-in, or starter placement. Each has advantages and disadvantages.

Broadcast spray. Most suspension fertilizers are broadcast sprayed, but in some situations, broadcast sprays are not advisable. Avoid broadcast sprays of UAN solutions whenever possible on hot, dry days unless the material will be cultivated or irrigated in, or rain is imminent. A great deal of the applied N can be lost to the crop when the air temperature is above 70 degrees. This loss can be lessened if you get rain in 2 to 3 days.

Nitrogen solutions are popular for grasses and small grains. But you should avoid broadcast application to rapidly growing crops. Leaf burn may occur on small grains when you make combined broadleaf herbicide and N applications.

Dribbling. Dribbling is applying the fluid fertilizers in narrow bands in either large drops or small streams. Distance between bands depends on the individual situation. Concentrating the material in very small areas generally lessens potential nitrogen loss from the urea in UAN solutions. There is less potential for crop burn as less of the crop is touched by the material. Because the drops are larger than in broadcast sprays, they roll off the plant rather than staying and causing burn.

Adoption of dribbling is limited because special equipment is required for accurate application. Dribbling covers only small portions of the total field, so you cannot efficiently combine pesticides with the fertilizer when you use this method.

Knifed-in. Using knife equipment allows precise placement of fertilizer material with respect to the plants. This method lessens volatilization losses by placement within the soil, and there is no danger of crop burn from overhead sprays. It is an excellent way to sidedress crops.

Specialized equipment is required, and as with dribble application, you can't combine pesticide application with the fertilizer because of the limited coverage area.

Starter. Fluid fertilizers are often used as a starter or pop-up material, in particular on corn and grain sorghum. "Starter" refers to fertilizer applied in a band near the row at planting; "popup" is fertilizer applied directly with the seed. Applying N and P in localized zones promotes root proliferation near the placed fertilizer, but yield response depends on growing conditions and the effect of all management practices. Avoid solution fertilizers as popup fertilizers because ammonia is extremely toxic to emerging seedlings.

Fertilizer Salt Damage Issues

Salt damage occurs when water is chemically removed from the seed by nearby fertilizer salts. In general, fertilizer salt damage causes delayed emergence and reduced stands. A long dry period after planting increases the chances of problems. In severe instances, you have to replant.

Rates used in popup applications depend on the salt index of the fertilizer. Do not apply a salt index greater than 5 in a pop-up application (directly with the seed). Salt index is determined by adding the amount of N to the amount of potash used. Phosphate does not contribute to the salt applied. An example is if you use a 7-12-7 at a rate of 100 pounds per acre, 7 pounds of N and 7 pounds of K₂O would give a total of 14 pounds salt applied.



Rates used in starter applications can be higher because distance from the seed is greater, but on sandy soils, do not use a salt index greater than 20 in a starter type application.

More information on salt indices is available in Extension Publication 2500 *Inorganic Fertilizers for Crop Production*.

Converting Pounds per Acre to Gallons per Acre

Soil test-based recommendations are often given in pounds per acre, so you have to convert to gallons per acre to determine the application rate. Get the weight of the fluid fertilizer per gallon from the fertilizer dealer. In fertilizer terminology, x-y-z means there are x pounds of N, y pounds of phosphate (P₂O₅), and z pounds of potash (K₂O) per 100 pounds of material regardless if it is solid or liquid.

Sample problem: A farmer wants to apply 120 pounds of N per acre using 32 percent solution. How many gallons does he apply?

Procedure: 32 percent solution is 32-0-0, so there are 32 pounds of N per 100 pounds of material.

Divide the desired amount of N by the percentage of N in the product:

$120 \text{ lb N} / 0.32 \text{ percentage of material} = 375 \text{ pounds of material}$
necessary to apply 120 pounds of N per acre

Then divide the amount of product needed by the weight per gallon of the product. 32-0-0 typically weighs 11.06 pounds per gallon:

$375 \text{ lb material} / 11.06 \text{ pounds per gallon} = 33.9 \text{ gallons per acre}$, or roughly 34 gallons per acre

Summary

There is no agronomic difference in the efficiency of liquid and dry fertilizers if they are applied properly. Therefore, use the same rate of nutrients from either source.

The negative-charged clay in most suspension fertilizers deactivates paraquat materials. Use other suspending agents, such as xanthum gum products, if you are applying these in the suspension fertilizer.

To avoid N loss by volatilization, do not broadcast spray a solution containing urea on hot, dry days unless you can incorporate by cultivation, irrigation, or rainfall within 2 to 3 days. Dribble or dry application is better in this instance.

Broadcast applications in reduced tillage should use droplets as large as possible. Severe crop burn is possible with 32-0-0 applied broadcast spray on growing crops.

You can inject pesticides into most fluid fertilizers and save a trip over the field. Always perform a compatibility test with small amounts of the materials to determine if you can mix them. **Always read the label on any pesticide to determine if it is legal and compatible with fluid fertilizers.**

Boron, sulfur, and other secondary and micronutrients can be custom mixed with fluid fertilizers if needed.

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By **Dr. Larry Oldham**, Extension Professor, Plant and Soil Sciences.



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