

UAN-32 Salt-Out Temperature: Storage, Crystallization and Handling Guide

For users of **UAN-32 liquid fertilizer**, understanding salt-out temperature is an important part of proper storage, transportation and handling. Urea ammonium nitrate solutions contain a high concentration of dissolved fertilizer salts, and temperature affects how much of those salts can remain dissolved.

When UAN-32 becomes sufficiently cold, dissolved salts can begin to crystallize. This temperature region is commonly referred to as the **salt-out temperature**.

TradeMark Nitrogen's UAN-32 formulation has a reported **salt-out temperature of approximately 45°F (7.2°C)**. For customers handling this product, the 45°F value should be considered when designing and operating storage tanks, piping, pumps and transfer systems.

What Is the Salt-Out Temperature of UAN-32?

The salt-out temperature is the temperature at which a concentrated fertilizer solution can begin forming solid crystals as its temperature decreases.

UAN-32 is an aqueous solution containing urea and ammonium nitrate. Both materials are highly soluble in water, but their solubility is temperature dependent.

As the solution cools, a point can be reached where all of the fertilizer salts can no longer remain dissolved under the existing conditions.

Crystallization can then begin.

This does **not** mean that UAN-32 suddenly freezes solid at its salt-out temperature. Salt-out and freezing are different phenomena.

Instead, salt-out generally begins with crystal formation within the liquid fertilizer.

TMN UAN-32 Salt-Out Temperature

TradeMark Nitrogen's UAN-32 formulation is approximately:

- **51% ammonium nitrate**
- **32% urea**
- **17% water**
- **Specific gravity: approximately 1.33**
- **Salt-out temperature: approximately 45°F (7.2°C)**

The formulation provides approximately 32% total nitrogen by weight.

Because the reported salt-out temperature is approximately 45°F, TMN recommends that customers consider temperature when planning UAN-32 storage and handling.

Why Does UAN-32 Crystallize?

UAN-32 is a highly concentrated fertilizer solution.

At normal operating temperatures, the ammonium nitrate and urea remain dissolved in the water phase. As temperature falls, however, the equilibrium between the dissolved fertilizer salts and water changes.

Eventually, crystals can begin forming.

Several practical factors can influence crystallization behavior, including:

- Product temperature
- UAN concentration
- Composition
- Water content
- Localized cold spots
- Length of exposure to low temperatures
- Tank and piping configuration

For this reason, operators should consider the temperature of the **entire UAN system**, rather than simply ambient air temperature.

Salt-Out Temperature Is Not the Same as Freezing Point

This distinction is important.

Freezing normally describes the conversion of a liquid into a solid phase as temperature decreases.

Salt-out describes dissolved fertilizer salts beginning to crystallize from a concentrated solution.

A UAN-32 tank can therefore remain largely liquid while containing fertilizer crystals.

Those crystals can still create significant operational problems.

What Happens When UAN-32 Gets Too Cold?

Crystal formation may initially be limited, but continued cooling or prolonged exposure can increase crystallization.

Potential operating consequences include:

- Crystals accumulating on tank surfaces
- Deposits in piping

- Restricted valves
- Pump suction problems
- Plugged strainers
- Reduced transfer rates
- Difficulty obtaining a homogeneous fertilizer solution

Small-diameter piping, dead legs, valves, strainers and exposed pump components can be particularly vulnerable because they can cool faster than the bulk liquid in a large storage tank.

Why Tank Temperature Alone May Not Tell the Whole Story

A large UAN-32 storage tank contains substantial thermal mass and may change temperature relatively slowly.

Exposed piping can behave very differently.

A section of pipe, valve or pump exposed to cold nighttime temperatures can cool much more rapidly than thousands of gallons of UAN in an insulated or sheltered tank.

Consequently, the bulk tank may appear acceptable while a remote portion of the transfer system approaches the product's salt-out temperature.

Storage-system design should therefore consider:

Tank + piping + valves + pumps + strainers + loading equipment

as one integrated temperature-management system.

Recommended Storage Approach for TMN UAN-32

Because TMN UAN-32 has a reported salt-out temperature of approximately 45°F, storage systems should be operated with an appropriate temperature margin above the salt-out point.

Rather than treating 45°F as a normal storage target, it should be viewed as a temperature at which crystallization becomes a concern.

A practical system should provide enough operating margin to account for:

- Instrument accuracy
- Temperature stratification
- Cold weather
- Localized cold spots
- Exposed piping
- Overnight temperature changes

Customers should establish site-specific operating limits based on their equipment, climate and operating practices.

Insulation

Insulation can help reduce heat loss from UAN-32 storage and transfer equipment.

Potential candidates for insulation include:

- Storage tanks
- Exposed transfer piping
- Valves where practical
- Pump suction piping
- Recirculation piping

Insulation does not create heat. It slows the rate at which heat is lost.

In climates where extended temperatures below the product's desired storage temperature are possible, insulation may need to be combined with an appropriate heating or recirculation strategy.

Tank Recirculation

Recirculation can be useful for maintaining a more uniform solution temperature and composition.

A properly designed recirculation system can help reduce temperature stratification and can assist with re-dissolving crystals if crystallization has occurred.

Recirculation should not, however, be considered a substitute for maintaining adequate temperature when environmental conditions can cool the entire system below the desired operating range.

Heating UAN-32

Where heating is necessary, the system should be designed specifically for fertilizer service.

The objective is controlled, uniform warming—not creating excessively hot surfaces.

Localized overheating should be avoided.

Heating-system selection should consider tank material, UAN chemistry, heat-transfer surface temperature, circulation and the manufacturer's operating recommendations.

What Should You Do if UAN-32 Crystallizes?

Crystallization does not necessarily mean that the product has been permanently damaged.

In many situations, crystals can be returned to solution through controlled warming and circulation.

The important objective is to restore a **uniform, homogeneous solution** before normal transfer or application.

Operators should avoid simply adding water without evaluating the consequences. Adding water changes product concentration and therefore changes the fertilizer analysis.

For commercial fertilizer, maintaining the specified nitrogen concentration is important.

UAN-32 Storage in Florida and the Southeast

Florida's climate reduces—but does not eliminate—the possibility of low-temperature UAN storage problems.

Cold fronts can produce temperatures well below typical seasonal averages, particularly in northern and central Florida and other areas of the Southeast.

Outdoor piping and smaller equipment can also approach ambient temperature much faster than a large bulk storage tank.

Customers should therefore consider actual site conditions rather than assuming that a generally warm climate eliminates salt-out concerns.

UAN-32 Storage Checklist

A sound UAN-32 storage program should consider:

- Product salt-out temperature
- Minimum expected ambient temperature
- Tank insulation
- Piping insulation
- Tank temperature monitoring
- Cold spots and dead legs
- Pump and valve exposure
- Recirculation capability
- Heating requirements
- Procedures for recovering crystallized product

The appropriate design will depend on storage volume, geographic location and operating conditions.

Frequently Asked Questions

What is UAN-32 salt-out temperature?

Salt-out temperature is the temperature region where dissolved fertilizer salts can begin crystallizing from a concentrated UAN solution.

What is the salt-out temperature of TradeMark Nitrogen UAN-32?

TradeMark Nitrogen's UAN-32 has a reported salt-out temperature of approximately **45°F (7.2°C)**.

Does UAN-32 freeze at its salt-out temperature?

Not necessarily. Salt-out refers to fertilizer salts crystallizing from solution and should not be confused with the entire solution freezing solid.

Can crystallized UAN-32 be recovered?

Crystallized UAN can often be returned to a homogeneous solution through controlled warming and circulation. The appropriate procedure depends on the storage system and degree of crystallization.

Should UAN-32 storage tanks be insulated?

Insulation can help reduce heat loss and moderate temperature changes. Whether insulation or supplemental heating is necessary depends on the product, tank design, location and expected winter conditions.

Can I add water to UAN-32 to prevent crystallization?

Adding water changes the fertilizer concentration and nitrogen analysis. Water should therefore not be added casually as a solution to a storage-temperature problem.

UAN-32 From TradeMark Nitrogen

TradeMark Nitrogen manufactures and supplies UAN-32 from Tampa, Florida.

Understanding salt-out temperature is one part of successfully storing and handling concentrated liquid nitrogen fertilizers. Customers should incorporate product temperature, storage equipment, piping and local climate into their UAN-32 handling plans.

For product specifications, availability and bulk UAN-32 supply, contact TradeMark Nitrogen.