UREA

• Urea is made by reacting \((\text{CO}_2)\) with anhydrous ammonia \((\text{NH}_3)\) under 3,000 psi (pounds per square inch) pressure and at 350° (200 atm).

  \[
  \text{CO}_2 + 2 \text{NH}_3 = \text{CO(\text{NH}_2)}_2 + \text{H}_2\text{O}
  \]

• The removal of water that occurs during the reaction is referred to as "dehydration."

• The resulting molten mixture is further processed into either prills or granules.

• Making A Liquid Solution
Liquid Urea

- Heat Of Solution In Water
  - 108 btu/lb
  - 216,000 btu/ton

- Endothermic Reaction

- Cost Of Heating Water

- Salt Temperature At Different Concentration
Figure 3.6: System 10-34-0, UAN solution, potassium chloride, water at 32°F.

10-34-0 from pipe reactor process
Numbers on contour line indicate % total plant nutrient soluble
(N + P₂O₅ + K₂O)
45% Polyphosphate
Contours = (N + P$_2$O$_5$ + K$_2$O) that remain in solution at 32 F

Crystallization zones

10-34-0, UAN-32, Muriate of Potash and water at 32 F system
KOH

- KOH + HCl $\rightarrow$ KCl + H₂O
- Takes High Temps And Catalyst To Reverse Action
- KOH + HNO₃ $\rightarrow$ KNO₃ + H₂O
- Highly Exothermic
- NOx emission potential
Receiving and Unloading Materials Into the Plant

- HAVE ALL PERTINENT SHIPPING INFORMATION, BOLs, DOT requirement, etc.
- REVIEW AND UNDERSTAND MSDS AND RMP/PSM REQUIREMENTS
- HAZARDOUS MATERIALS RECEIVING
Filling Liquid Storage Tanks

- Make Sure Inbound Transport Is Connected to the Correct Storage Tank
- Open All Appropriate Valves and Close Others
- Contain All Leaks
- Check Tank Inventory Prior To Transfer
- Wear Proper PPE
- Close All Appropriate Valves Upon Completion Of Transfer
- Complete All Documentation and Record Ending Inventory
Secondary and Micro Nutrients

Use Good Quality Micro Products = Improved Blending
Pay Attention to Order Of Addition, pH, etc
Be Careful Of Point Introduction Precipitation
Make Sure Adequate Mixing Time Prior To Loading
? Truck Mixing Of Blends
Pesticides

- MSDS
- PPE
- Order Of Addition, pH,
- Chemical Compatibility
- Wetting Agent
- T
HOUSEKEEPING

- Keep Leaks Repaired
- Keep Spills To A Minimum And Cleaned Up
- Avoid Contamination
- Keep Good Records
- Retain Samples
- Documentation

HOUSEKEEPING MUST BE A TOP PRIORITY
Appearance Value – Cross Contamination

- A Product Is Only As Good As The Skill It Was Made
- Contamination Can Be Disastrous To A Blend
- Dries That Go Into Blends Must Be Segregated
- Alley Ways Must Not Be Allowed To Co-Mingle
Scale Care and Standard Weights

- Certified Equipment
- Clean Equipment Works Properly
- Load Cells
- Mass Meters
- Keep It Clean And Calibrated
ANALYTICAL WORK
Sampling

- Inbound Materials
- Outbound Materials
- Retain Samples
Actions Taken After Receipt of Analytical Reports

- QA/QC
- Customer Service

KNOW WHAT YOU DO AND DO IT WELL
PERSONNEL RESPONSIBILITIES

- Safety And Quality Are Everyone's Business
- Be Properly Trained
- Understand All Products
- Chemistry (basic understanding)
Training

- Haz-ops Trained. What Level?
- PPE
- Safety Meetings/Documentation
- Understanding Of the Process
- Response To Releases, etc.
- Understanding Of Chemistry
Supervision

- If You Are Not Committed To Training
- If You Are Not Committed To Proper Equipment
- If You Are Not Committed To Safety

Don’t Make These Products And Have Someone Toll Them For You