Air Quality Enhancement Activity– AIR08 – Nitrification inhibitors or urease inhibitors

Enhancement Description
The use of an ammonia or ammonium fertilizers with a substance that inhibits the biological oxidations of ammoniacal nitrogen to nitrate nitrogen or the use of surface applied urea products with a substance that inhibits hydrolytic action on urea by urease enzyme that when applied to soils results in less urea nitrogen lost by ammonia volatilization (AAPFCO). This enhancement is only applicable to nitrogen applied within 30 days of planting. This does not apply to “pop-up” or starter nitrogen sources applied at planting time.

Land Use Applicability
Crop, Pasture

Benefits
When ammonia or ammonium N is added to the soil, it is subject to a process called nitrification. Soil bacteria called nitrosomonas convert the ammonia (NH₃) or ammonium (NH₄) to nitrate (NO₃). This conversion is strongly temperature dependent and occurs quickly under warm soil temperature conditions. Using a nitrification inhibitor with early spring applications of ammonia or ammonium nitrogen will slow the conversion to nitrate until it can be readily used by crops. This will allow the crop to take up more of the N and ultimately reduce the release of nitric oxide (an ozone precursor) and nitrous oxide (a greenhouse gas) to the atmosphere. These conversion processes can produce nitrous oxide as a byproduct due to inefficiencies in the conversion processes. Nitrous oxide is a potent greenhouse gas which, on a molecular basis, has 310 times the global warming potential of carbon dioxide.

Using a urease inhibitor (with surface applied urea products) will reduce the volatilization and release of ammonia into the atmosphere that occurs as urea hydrolyzes. Urease is an enzyme produced by bacteria in the soil. It catalyzes the hydrolysis of urea into carbon dioxide and ammonia. Ammonia released to the atmosphere is a pre-cursor to PM2.5 particulate matter.

Conditions Where Enhancement Applies
This enhancement applies to climatic areas and soils on cropland or pastureland where nitrogen fertilizer is applied AND where either nitrification inhibitors or urease inhibitors are recommended by the Land Grant University.

Criteria
Use either a nitrification inhibitor or urease inhibitor product (depending upon the type of nitrogen fertilizer or manure used) on the treatment acres.
1. Nutrient application rates must be within Land Grant University recommendations based on soil tests and established yield goals considering all nutrient sources. The nutrient application rate must take into account the additional nitrogen that will remain available to the plant due to the inhibition of the nitrification processes.

2. Apply the nitrification inhibitor or urease inhibitor according to manufacturer recommendations.

3. The methods used to apply the nitrification inhibitor or urease inhibitor must not increase soil surface disturbance.

4. This enhancement is only applicable for nitrogen applications that take place within 30 days prior to planting time.

5. Materials which are acceptable for this enhancement must be defined by the Association of American Plant Food Control Officials (AAPFCO) and be accepted for use by the State fertilizer control official, or similar authority, with responsibility for verification of product guarantees, ingredients (by AAPFCO definition) and label claims.

Adoption Requirements
This enhancement is considered adopted when ammonia or ammonium fertilizers or urea products that contain a substance as described in the Enhancement Description above have been utilized in accordance with the Criteria of this job sheet on the land use acreage.

Documentation Requirements
1. A map showing where the enhancement was applied,
2. Date(s) of application of fertilizer with inhibitor,
3. Acres of land treated,
4. Soil test results,
5. Manure analysis results (where applicable),
6. Crops grown and yields (both yield goals and measured yield), and
7. Calibration of application equipment.

Note: In lieu of documenting each individual item listed in the Documentation Requirements, a Certified Crop Advisor plan that contains each of the items may be substituted.

References


South Dakota Goals:
Improve fertilizer management and air quality in relation to the application of nitrogen fertilizer on agricultural lands.

Acceptable products must contain one of the following materials:

<table>
<thead>
<tr>
<th>Material</th>
<th>Mechanism</th>
<th>Category</th>
<th>CSP Enhancement</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-(n-butyl) thiophosphoric triamide (NBPT)</td>
<td>Nitrogen stabilizer</td>
<td>Urease inhibitor*</td>
<td>AIR08</td>
</tr>
<tr>
<td>Nitrapyrin [2-chloro-6-(trichlomethyl)-piridine]</td>
<td>Nitrogen stabilizer</td>
<td>Nitrification inhibitor*</td>
<td>AIR08</td>
</tr>
<tr>
<td>Dicyandiamide (DCD) (C2H4N4)</td>
<td>Nitrogen stabilizer</td>
<td>Nitrification inhibitor*</td>
<td>AIR08</td>
</tr>
<tr>
<td>3,4-dimethylpyrazole phosphate (DMPP)</td>
<td>Nitrogen stabilizer</td>
<td>Nitrification inhibitor*</td>
<td>AIR08</td>
</tr>
<tr>
<td>Cyanamide Lime (CaNCN)</td>
<td>Stabilized nitrogen</td>
<td>Nitrification inhibitor*</td>
<td>AIR08</td>
</tr>
</tbody>
</table>

*Nitrogen stabilizers (urease inhibitors or nitrification inhibitors for AIR08) must list at least one of the materials from the above table as their active ingredient.


or


This enhancement is not meant to include use of coated and uncoated “slow release” fertilizers. (Please use Enhancement WQL24 for those).

The following variances (yellow highlights) are granted to the AIR08 - Nitrification inhibitors or urease inhibitors enhancement (job sheet dated November 1, 2013). These variances are only applicable to the enhancement job sheet with the subject date used for the 2014-1 signup.

An Equal Opportunity Provider and Employer June 2014
**Enhancement Description**
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**Benefits**
When ammonia or ammonium N is added to the soil, it is subject to a process called nitrification. Soil bacteria called nitrosomonas convert the ammonia (NH3) or ammonium (NH4) to nitrate (NO3). This conversion is strongly temperature dependent and occurs quickly under warm soil temperature conditions. Using a nitrification inhibitor with applications of ammonia or ammonium nitrogen within the 30 day period prior to planting will slow the conversion to nitrate until it can be readily used by crops. This will allow the crop to take up more of the N and ultimately reduce the release of nitric oxide (NO, an ozone precursor) and nitrous oxide (N2O) a greenhouse gas) to the atmosphere. Nitrous oxide is a potent greenhouse gas which, on a molecular basis, has 310 times the global warming potential of carbon dioxide.

Using a urease inhibitor (with surface applied urea products) in the period 30 days before and after planting will reduce the volatilization and release of ammonia into the atmosphere that occurs as urea hydrolyzes. Urease is an enzyme produced by bacteria in the soil. It catalyzes the hydrolysis of urea into carbon dioxide and ammonia. Ammonia released to the atmosphere is a precursor to PM2.5 (fine particulate matter).

**Criteria**
Use either a nitrification inhibitor or urease inhibitor product (depending upon the type of nitrogen fertilizer or manure used) on the treatment acres.

1. Nutrient application rates must be within Land Grant University recommendations based on soil tests and established yield goals considering all nutrient sources. The nutrient application rate must take into account the additional nitrogen that will remain available to the plant due to the inhibition of the nitrification processes.
2. Apply the nitrification inhibitor or urease inhibitor according to manufacturer recommendations.
3. The methods used to apply the nitrification inhibitor or urease inhibitor must not increase soil surface disturbance.
4. For using nitrification inhibitors this enhancement is only applicable for nitrogen applications that take place within 30 days prior to planting time. If using urease inhibitors this enhancement can be used in the period 30 days prior to and 30 days after planting.
5. Materials which are acceptable for this enhancement must be defined by the Association of American Plant Food Control Officials (AAPFCO) and be accepted for use by the State fertilizer control official, or similar authority, with responsibility for verification of product guarantees, ingredients (by AAPFCO definition) and label claims.