United States Department of Agriculture
Natural Resources Conservation Service

2012 Ranking Period 1

# 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**
Cropland, Pastureland

**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 ($NH_3$) or ammonium ($NH_4$) to nitrate ($NO_3$). 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**


- Nelson, D. R. and D. Huber. Nitrification Inhibitors for Corn Production. National Corn Handbook, Iowa State University. http://www.extension.iastate.edu/Publications/NCH55.pdf
- Rankin, M. Nitrification Inhibitors and Use. University of Wisconsin Extension. http://www.uwex.edu/ces/crops/ninhib.htm
- The Pennsylvania State University 2003, Agronomy Facts 51, Starter Fertilizer http://cropsoil.psu.edu/extension/facts/agfacts51.cfm
- AAPFCO. 2011. Association of American Plant Food Control Officials, Official Publication No. 64. AAPFCO Inc., Little Rock, Arkansas.

**Michigan Supplement**

**AIR 08**

The Michigan Department of Agriculture & Rural Development (MDARD) inspects, tests, and issues licenses and registrations for fertilizer, soil conditioner, and liming materials distributed or manufactured in Michigan. All firms that have their names and address on the labeling or invoicing for an agricultural fertilizer manufactured or distributed in the State of Michigan are required to obtain a Facility License. A facility license is sufficient for mixes specifically requested by the consumer prior to blending and where the consumer is the end-user of the blend. All bagged fertilizers, including packaged custom mixed fertilizers, must be conspicuously labeled with the information found on the MDARD website. Michigan's Fertilizer Law, regulations and testing requirements are consistent with AAPFCO standards.

- Urease and Nitrification inhibitors are eligible for this enhancement. See the following about the use of nitrogen fertilizer additives:

  MSU Extension News articles
  Nitrogen Fertilizer Additives
  http://news.msue.msu.edu/news/article/nitrogen_fertilizer_additives

  Nitrogen Fertilizer Management Strategies
  http://news.msue.msu.edu/news/article/nitrogen_fertilizer_management_strategies

  North Central Extension Research Activity Publication
  Nitrogen Extenders and Additives for Field Crops, North Dakota State University, D.W. Franzen and NCERA-103 Committee, http://www.ag.ndsu.edu/pubs/plantsci/soilfert/sf1581.pdf

Written documentation shall include the fertilizer product label and method of application.