



# Western Dairy News

for the West, about the West, from the West

## Making a plan for ammonia reduction?

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Ammonia used to be considered as only a nuisance odor emitted by dairies and other livestock operations. Now, it is known to react with atmospheric nitric and sulfuric acids to form fine particulate matter (known as PM2.5), which is a major contributor to smog production.

This fine particulate matter is of concern because it has numerous important human health effects. It can penetrate deep into the lung tissue, contributing to asthma, bronchitis, and other lung diseases, and has also been linked to heart attacks and strokes.

In addition, when ammonia is converted to PM2.5 it becomes more mobile and can travel longer distances to affect populations and/or be re-deposited on the ground through rainfall or dry deposition. Nitrogen deposition in Rocky Mountain National Park has resulted in increased soil and water N levels, which can cause changes in plant species and eutrophication.

So, ammonia is not just a nuisance anymore; it can have serious human health and mountain ecosystem impacts.

Regulations concerning ammonia emissions are likely to be developed in the future. There are practices that you can use to be pro-active and reduce ammonia emissions now, and more are in development. By using a combination of Best Management Practices (BMPs), dairies can reduce ammonia emissions by 65 to 70 percent.

Since the production facility, manure storage and treatment areas, and sites where manure is applied to land are all major sources of ammonia emissions, ammonia BMPs should be chosen in each of the areas of nutrition, production site management, manure storage and treatment, and land application of manure.

Nutrition BMPs focus on **precision feeding**; the practice of providing animals what they need and no more. Overfeeding

you money!

Experiments in Switzerland found dramatic reductions (up to 76 percent) in ammonia emissions from laboratory simulations of manure storage from dairy cows fed reduced protein in the diet. Milk production of 68 pounds per head per day was maintained in the low protein diets by supplementation of a commercially available bypass methionine.

A study last year showed reducing crude protein in dairy diets reduced ammonia emissions when manure was applied to land. Lower crude protein diets reduced urinary urea-N levels, thus leading to less ammonia loss from land application. Therefore, nutritional changes continue to reduce ammonia emissions during manure storage and land application.

In pens, **dust control** BMPs will help to reduce ammonia loss by decreasing the airborne PM2.5 potential. Frequent manure harvesting, combined with pen moisture management, can be very effective in minimizing dust. Water-

ing the pens, especially those areas with low activity and low moisture, is an effective BMP.

Another recent study compared ammonia losses from dairies using different **bedding types**. Sand bedding reduced ammonia loss by over 50 percent compared to chopped corn stalks and composted manure; chopped straw and pine shavings had intermediate ammonia losses.

BMPs for manure storage and treatment can also be helpful to reduce ammonia loss to the air. Reducing storage time reduces N



protein has been shown to increase ammonia emissions from both monogastrics and ruminants, so take care to avoid this practice. Analyzing feeds regularly is a useful BMP for precision feeding since feed contents are quite variable.

**Phase feeding** is a commonly used practice for meeting livestock nutrient needs without exceeding them. By dividing the herd by growth stage and productivity, more precise diets can be fed that meet animal needs while minimizing ammonia losses to the air. These practices can also save

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loss to the atmosphere by reducing the reaction time. Covering manure stockpiles and lagoons, and keeping stockpiles dry also reduce N emissions.

Aerobic lagoons and anaerobic digesters are also known to conserve nitrogen. The crust that sometimes forms naturally on dairy lagoons was recently measured to reduce ammonia emissions by up to 50 per-

cent. Bedding type continues to have an impact if solid manures are composted; wood chip bedding results in much lower nitrogen loss to the air than straw bedding during the composting process.

When manure is applied to land, BMPs continue to play an important role in reducing ammonia emissions. Incorporation of manure immediately after application is

critical to retaining nitrogen in the soil. Slurries should be injected and drop nozzles could be used for sprinkler irrigation to reduce "air time" and minimize ammonia losses.

I don't mean to alarm you with yet another concern, but ammonia emissions regulation is likely. Decisions made now could ease your compliance later.

## Air quality: Current issues and future regulations

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Air quality is a hot topic in the livestock industry these days due to human health and environmental impacts. Many states are beginning to develop and enforce regulations for a variety of emissions including ammonia, hydrogen sulfide, particulate matter (dust), and odor. While many producers look at these regulations as a nuisance, they might actually help your business in the long run.

Regulations are instated to protect human health . . . your health . . . as well as maintain environmental integrity. Exposure to many of the emissions from livestock operations can cause long term health effects such as asthma, bronchitis, cardiovascular disease, and a variety of short term effects like coughing, headache, eye and skin irritation. It is mainly workers and operators who experience these ailments, but with the encroachment of urban areas into agricultural lands local communities and neighbors are also beginning to see these detrimental health effects from livestock operations.

The biggest complaint from local communities is of odor from livestock operations. Odor is a combination of different gaseous emission including ammonia, hydrogen sulfide, and volatile organic compounds (VOCs). People feel that odor decreases their quality of life and research has shown that odor can actually cause depression and changes in mood and have negative health effects, even with intermittent exposure.

With the prevalence of the urban neighborhood arising more frequently in once rural settings, it will be necessary to cooperate with your local community if you want to keep your livestock operation in good standing. Over the past few years there has been an increase in local nuisance lawsuits directed at getting livestock operations shut down or relocated. The only way to get avoid these issues is to get in compliance and reduce emissions.

Reducing emissions has the added benefit of maintenance of air quality both locally and globally. Atmospheric visibility is decreasing at a steady rate in heavily populated areas, and due to wind current, it is coming to a rural area near you.

One way livestock contributes to atmospheric degradation is via ammonia gas which is emitted in large quantities from

manure. When ammonia combines with combustion emissions from cars and machinery it forms fine particles known as PM2.5 (Particulate Matter smaller than 2.5 microns in diameter). These fine particles lead to smog and a decrease in visibility, and in addition, are able to be respired and deposited deep in lung tissue, further exacerbating the human health issue.

### Gasses have global impact . . .

These particulates are also able to travel long distances, depositing in neighboring counties and pristine wilderness areas. This leads to stream and lake degradation and soil acidification. Other livestock emissions such as the greenhouse gases (methane, carbon dioxide and nitrous oxide), have a global rather than local impact, and are the contributing gases to global warming. By minimizing emissions, producers can help to reduce local and global air quality issues.

State and federal regulations were created for producers to know what the exposure limits are for human and environmental impact of emissions, and what reductions they should aim for. They can be seen as guidelines for operating your business with the least impact while maintaining a good standing in your local community.

Unfortunately, most livestock producers don't see it this way and so regulations are viewed as a pain rather than help. And, sometimes regulations do not reflect current research and emissions values, and so they are a pain. The only way to improve this and reduce emissions is with education of the current issues and research by both regulators and producers.

Currently, only a few states, such as California, have strict emissions regulations. Most of these were created and enforced

retrospectively rather than proactively. Previously, regulations for livestock were housed under the Clean Air Act, which didn't have quality emission estimates for livestock confined animal feeding operations (CAFOs).

In order to improve the current emission values, EPA is currently putting together a study called the Air Quality Compliance Agreement to look at emissions from livestock CAFOs. This study, which begins in 2006, aims at getting accurate emission values for ammonia, hydrogen sulfide, VOCs, and PM from livestock operations located across the country. These new emissions estimates will help to validate and improve current regulation values. This project will help producers by ensuring accurate measurement of true emissions, and will take into account the employment of technologies that have helped reduce emissions over the years.

Universities across the country are also helping to come up with more accurate emission values. Here at Colorado State University, we are working to quantify the emissions of major gases from dairies. We are looking at the vertical profile as well as seasonal and diurnal variability of a variety of compounds including ammonia, nitric acid, methane, carbon dioxide, nitrous oxide, and PM. Our goal is to characterize the emission profiles of gases from dairies to help producers understand their emission patterns. We also hope to show that seasonal variability is very important in making emission regulations, and should be considered to make regulations more accurate and to help producers meet regulation standards more easily.

Industry representatives, Extension specialists, and researchers are all working to come up with solutions to reduce emissions from livestock operations. There are some simple changes that can be integrated into current management practices that can make a big impact on emission rates. I encourage producers to contact their local air quality specialist to see what they can do.

It is up to producers to be proactive and begin to reduce emissions before they are forced to do so by costly fines and citations. This will reduce the impact of regulations when they do pop-up in your state, and help mitigate air quality problems before they are too big to fix. Being proactive and minimizing emissions before regulations force you to is the best way to make a positive impact on air quality and community health impacts.

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