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NGFA Advisory: High-Moisture Levels in Some New-Crop Corn Deliveries May Warrant Atmospheric Testing to Protect Employees

The National Grain and Feed Association (NGFA) recently was notified by a few member companies of isolated incidents where the post-harvest respiration of some new-crop harvested corn appears to be occurring rapidly after unloading; thus, leading to elevated levels of carbon dioxide (CO_2)and depleted oxygen levels – particularly in low-lying storage areas– both at farms and commercial facilities.

Importantly, this respiration, which reports have linked primarily to high-moisture corn deliveries, has occurred over a period of hours, rather than days. When handling a wet crop, it is possible that unusually high levels of carbon dioxide (CO_2) and low levels of oxygen may be present in areas where employees work, such as boot pits, tunnels and basements. In these situations, managers are advised to take precautions by monitoring atmospheric conditions when working in or near areas where high-moisture corn is present, particularly boot pits and other below-grade-level work spaces.

As the bulk of this fall's harvest nears, the NGFA wishes to remind the industry about prudent procedures to protect employee safety, as well as applicable Occupational Safety and Health Administration (OSHA) standards and relevant NGFA and OSHA safety training materials that are available. Members also should consider sharing this information with farmer-customers to apprise them of this potential situation when storing new-crop corn in farm bins.

Aeration

Once stored, it is important to monitor grain for elevated levels of CO_2 both to minimize spoilage and protect employees. Elevated levels of CO_2 in localized pockets of a grain mass are attributable to a combination of factors, such as moisture content, presence of molds, insect infestation and temperature.

Safe grain storage conditions are found at relative CO_2 concentrations between 400 and 500 parts per million (p.p.m.). Levels present that are consistently around 1,000 p.p.m. means a problem could be occurring. And consistent readings of 3,000 p.p.m. or greater indicates spoilage is occurring.

Using CO_2 sensors to detect and monitor CO_2 levels in the headspace of a storage structure or at the aeration fan outlets can provide an early warning about grain spoilage.

Here are several management practices that, if applied, should minimize grain storage problems while protecting employee safety:

- Aerate as soon as possible after binning to remove harvest or dryer heat and to reduce grain temperature to 60° F.

- Maintain the grain, and monitor temperatures and aerate as needed.

- Cool to 40°F for winter storage

- Maintain the grain-seal fan opening when the grain is cooled and ready for winter storage.

Grain Bin Entry

Do not enter a grain storage unit unless absolutely necessary.

If it is necessary to have employees enter a bin, silo or tank, commercial facilities are to follow applicable practices found in OSHA's grain handling facilities standard *[29CFR1910.272(g)]*, which took effect in 1988, to help minimize risk to employee safety.

Specifically, the OSHA standard requir es employers to:

- Issue written permits before entry occurs, unless the employer or its representative (who otherwise would authorize a permit) is present during the entire operation;

- Disconnect, lock-out and tag all mechanical, electrical, hydraulic and pneumatic equipment feeding or emptying the structure that presents a danger to persons while inside bins, silos or tanks;

- Test the atmosphere within a bin, silo or tank for the presence of combustible gases, vapors and toxic agents ***if the employer has reason to believe*** such hazards may be present. Testing for the presence of oxygen also is required unless there is continuous natural air movement or forced air ventilation before and during the time persons are inside the structure. Appropriate respirators are to be provided to employees entering storage structures if ventilation cannot eliminate toxicity or oxygen deficiencies;

- Equip persons entering bins, silos or tanks from the top with body harnesses with lifelines, or a boatswain's chair meeting OSHA requirements; and

- Station an observer outside the structure during entry operations who is "equipped to provide assistance" and trained in rescue procedures. Employers also are required to provide equipment for rescue operations.

Training Materials Available

The NGFA has several education and training materials available to assist:

- ***Permit Required Confined Space (PRCS)/Boot Pit Evaluation Guide for Grain Elevators:*** The NGFA has completed a guidance document designed to assist grain handlers in evaluating if a "boot pit" is a permit-required confined space based upon OSHA's Permit-Required Confined Space standard and OSHA's Confined Spaces Advisor.

- ***Your Safety Matters*****:** Developed jointly in 2010 by the NGFA and Grain Elevator and Processing Society (GEAPS), this safety training DVD is geared specifically to employees of grain-handling, feed-

manufacturing and grain-processing operations. The 30-minute DVD, which also is available in Spanish, addresses many safety-related issues, including confined space safety.

- ***Grain Bin Safety on the Farm:*** The National Corn Growers Association and the National Grain and Feed Foundation (NGFF) – the NGFA's research and education arm – in 2011 developed a joint DVD to promote grain bin safety on the farm.

- ***"Don't Go With the Flow"*:** Developed in 1998 by Purdue University under a grant from the NGFF, this program reviews the hazards associated with flowing grain and the most common types of grain entrapments at commercial facilities.

In addition, OSHA has developed the following web page to provide employers and workers with current safety and health information on grain handling facilities: www.osha.gov/SLTC/grainhandling/index.html.

Members with any questions regarding this advisory are encouraged to contact NGFA Director of Safety and Regulatory Affairs Jess McCluer at 202-289-0873, or by email at jmccluer@ngfa.org.