



Yani Bettencourt / Market Manager, Americas / Vaisala / Boston, MA, USA

Pursuit of the Perfect Potato Chip

From farm to fryer, potatoes grown to make potato chips are sensitive to environmental conditions that affect their fry quality – their appearance, taste and appeal when processed. One of the most unpopular chip defects – dark brown spots on the chips – is a result of exposure to elevated levels of carbon dioxide (CO₂) during storage.

“The consumer aesthetic is a driving force for no-defect chips. Consumers prefer a clean white-yellow chip,” says Todd Forbush, vice president of U.S.-based Techmark, Inc.

Techmark designs air-handling operations for fruit and vegetable storage facilities. These systems use advanced technology to monitor environmental conditions to regulate ventilation in order to meet the requirements of the occupancy load, in this case, potatoes.

Stress Reduces Fry Quality

In North America, chip potatoes are harvested in July, August and September with chips being pro-

Carbon dioxide monitoring technology helps make defect-free chips.

duced year round either from freshly harvested or stored potatoes. During storage, potatoes continue to respire, consuming oxygen and internal sugars (converted from stored starches) and producing CO₂, water and heat.

Stress increases the potato's respiration rate, increasing the sugar concentration in the potato. These sugars cause defects in fry quality, specifically dark brown spots.

The three key environmental factors that require monitoring and control during storage to maintain

quality and reduce stress are temperature, humidity and CO₂. When these environmental factors are outside of desired ranges, the potatoes are subject to stress.

Sources of High CO₂

Elevated levels of CO₂ are stressors to stored potatoes.

“When CO₂ levels reach 2,500 parts per million, action should be taken for fresh air exchange to dilute the CO₂,” says Forbush.

CO₂ can build up when facility ventilation is reduced to control temperature and due to natural respiration rates relative to the life stage of the potato.

“The maturity of the potato dictates respiration levels. Immature potatoes have high respiration, mature potatoes low and over mature potatoes again high respiration as they go into hyperactive mode before the end of life,” Forbush adds.

Senescence is one of many conditions considered by Techmark for its air-handling system design.

Growers Rewarded for Quality

Growers have significant incentive to supply the most defect-free potatoes since payment is based on weight and meeting fry quality requirements of the chip processor. Techmark works closely with growers to maintain quality standards that earn bonuses from the processors.

If a grower’s potatoes do not meet the processor’s quality standards – typically a defect rate of 15 percent or less – the grower may need to seek other, lower paying markets for the potatoes.

Vaisala GMD20 Delivers Reliability

Techmark develops custom air-handling systems that monitor, control and distribute air to specification in potato storage facilities. In facilities where potatoes are stored 15 to 20

Techmark Knows Vegetables

Techmark, Inc. based in Lansing, Michigan, specializes in the analysis of stored fruit and vegetables, identifying product quality issues, and working with growers to minimize factors during storage so the grower can deliver the highest yield of defect-free product.

The company specializes in design and development of HVAC systems for potato, onion, carrot, citrus fruit and beet storage facilities and for mushroom production

facilities worldwide. Techmark has six laboratories in the U.S. and Canada that analyze potato quality, including color, sucrose and glucose and to provide defect scores to growers on a regular basis. The labs perform analysis primarily on process potatoes, which are used for chips and fries. Other major markets for potatoes are fresh potatoes, used by consumers to cook at home, and seed potatoes.

feet deep, sufficient air distribution is as important as the air parameters.

Techmark has selected the duct-mounted Vaisala CARBOCAP® Carbon Dioxide Transmitter GMD20 for its air-handling systems. Vaisala GMD20 provides excellent long-term stability and high resistance to contaminants. It also withstands high humidity, a condition found in potato storage where humidity is maintained as high as possible without free water to maintain product weight.

“Vaisala’s CO₂ sensors have been extremely reliable,” Forbush says.

“We can count on their product availability with the lead times we need and Vaisala’s customer support.”

Bottom Line Benefits

Techmark recently worked with a major North American snack food processor to improve the process quality of its chip potatoes shipped by rail. The rail cars were not ventilated, and over several days, CO₂ accumulated to levels that could adversely impact fry quality. According to Techmark, installing Vaisala GMD20 transmitters led to improvements in ventilation control with positive results realized on the fry quality of potatoes shipped by rail.

More potato growers, led by the chip potato and fried potato markets that are especially sensitive to



Analysis of low fry quality of chips due to elevated CO₂ in the storage atmosphere. Image courtesy of Techmark, Inc.



Analysis of high fry quality of chips in the Techmark Laboratory. Image courtesy of Techmark, Inc.

defects, are adopting new technology to monitor and control environmental factors that can adversely impact quality and profitability.

Further information:

www.vaisala.com/GM20

Measuring Carbon Dioxide in the Soft Drinks Industry



In the United States, OSHA (Occupational Safety & Health Administration, U.S. Department of Labor) requires the average exposure limit of CO₂ to remain at, or below, 5,000 ppm during an eight hour working shift. This American company explained that they purchased Vaisala's CARBOCAP® transmitters to monitor the levels of CO₂ in the filler room. When CO₂ levels pass 4,900 ppm, an exhaust fan system is activated to remove the CO₂ from the filler room. The fans turn off once the level returns to 1,000 ppm.

Why Vaisala?

Vaisala has a long history of quality products and reliable services. Vaisala's CO₂ measurement is based on a unique CARBOCAP® technology with a built-in true reference measurement that enables long-term stability and ensures reliable measurement. The products require minimal maintenance and calibration.

Benefits of Reliable CO₂ Measurement

The company has generally been satisfied with the CO₂ transmitters as they require little or no maintenance, which saves time. A representative of the company does not believe that there is another company that could match the efficiency and reliability of Vaisala's products, sales and services.

Source: Vaisala News 154/2000

Carbon dioxide is used to carbonate the beverages in the production of soft drinks. In the United States, OSHA requires that the CO₂ level remains at, or below, 5,000 ppm in the atmosphere of any filler room area. A major soft drink manufacturer has successfully used Vaisala's CARBOCAP® transmitters in their bottling plant.

It is necessary to measure carbon dioxide reliably in bottling plant environments. Vaisala CARBOCAP® Carbon Dioxide Transmitter Series GMT220 provides a well-founded solution for this measurement need. Due to the long-term stability and reliability, the lifetime cost of the sensor makes CO₂ monitoring easy and economical.

Safe levels of CO₂ in the Workplace

Carbon dioxide is used to carbonate the beverages in the production of

soft drinks. While the containers are being filled during the bottling process, large volumes of carbon dioxide are emitted from the fillers into the filler room atmosphere.

As high concentrations of CO₂ are clearly hazardous, most countries, including the USA, have set workplace exposure limits. In the United States, the exposure limit is 5,000 parts per million (ppm). Occupations where carbon dioxide can rise to dangerous levels include brewing and carbonated drink industries.

VAISALA

Please contact us at www.vaisala.com/requestinfo



Scan the code for more information

Ref. B211532EN-A ©Vaisala 2015
This material is subject to copyright protection, with all copyrights retained by Vaisala and its individual partners. All rights reserved. Any logos and/or product names are trademarks of Vaisala or its individual partners. The reproduction, transfer, distribution or storage of information contained in this brochure in any form without the prior written consent of Vaisala is strictly prohibited. All specifications — technical included — are subject to change without notice.

www.vaisala.com