Dewpoint Measurement in Food Packaging

APPLICATION NOTE

SHAW MOISTURE METERS

Dewpoint measurement in food packaging confirms one thing: the nitrogen or compressed air protecting the product is actually dry enough. Modified Atmosphere Packaging (MAP) replaces the air inside a package with a protective gas blend, usually nitrogen alone or with carbon dioxide, to displace the oxygen that drives spoilage. Many manufacturing plants generate that nitrogen on site with a pressure swing adsorption (PSA) or membrane generator, then pipe it to gas flush manifolds on flow wrap and other form fill seal (FFS) lines.

The amount of trace moisture decides whether that gas actually protects the product. Nitrogen or carbon dioxide carrying more water vapour than its purity specification allows can promote mould growth and contaminate dry ingredients. It can also soften textures that should stay crisp, undercutting the reason the line runs modified atmosphere packaging. Dewpoint, the temperature at which water vapour starts to condense, shows whether the gas is dry enough before it reaches the package.

Why Nitrogen and Compressed Air Quality Matters in Food Packaging

Compressed air and nitrogen do several jobs on a packaging line and each one has its own reason to stay dry.

Modified Atmosphere Packaging

Nitrogen and carbon dioxide flush oxygen out of the package head space so the product does not oxidise or spoil on the shelf. Supplied as the food additives E941 and E290, both gases carry a moisture specification set out in EIGA Doc 126/20.

Direct Product Contact Air

Compressed air blows debris off product, conveys dry ingredients such as flour or powders and drives cylinders on the packaging machine itself. Some of it sits close enough to the product that food safety guidance treats it as direct food contact, held to ISO 8573-1:2010 air quality.

Nitrogen Generator Feed Air

Before any of that, the same compressed air has to be dry



enough that the generator's membrane or carbon molecular sieve (CMS) keeps separating oxygen properly. Feed it wet air and the nitrogen it produces gets wetter too. Sites that buy in bulk liquid nitrogen skip this step but not the checks that follow it.

Why Moisture is a Problem in Food Packaging

A gas that reads correctly on oxygen or carbon dioxide percentage can still be too wet and the consequences often surface well after the package leaves the line.

Mould Growth

Once local moisture pushes a product's water activity (aw) above roughly 0.85, common mould species can establish themselves. The result is odours and visible growth inside a pack that looked fine at the time of sealing.

Caking and Loss of Flowability

In powdered or granular products, adsorbed water bridges fine particles together. It welds them into lumps that block dispensing systems and clump instead of pouring freely.

Texture and Shelf Life Loss

Starch and protein in snacks and baked goods plasticise as they take on moisture. That softens the structure that gives a crisp product its snap, well before the printed best before date.

Nitrogen Generator Degradation

Wet feed air reduces a PSA generator's carbon molecular sieve separation efficiency. The nitrogen it delivers to the line quietly gets less pure and less dry at the same time.

Where Dewpoint is Measured in the Gas System

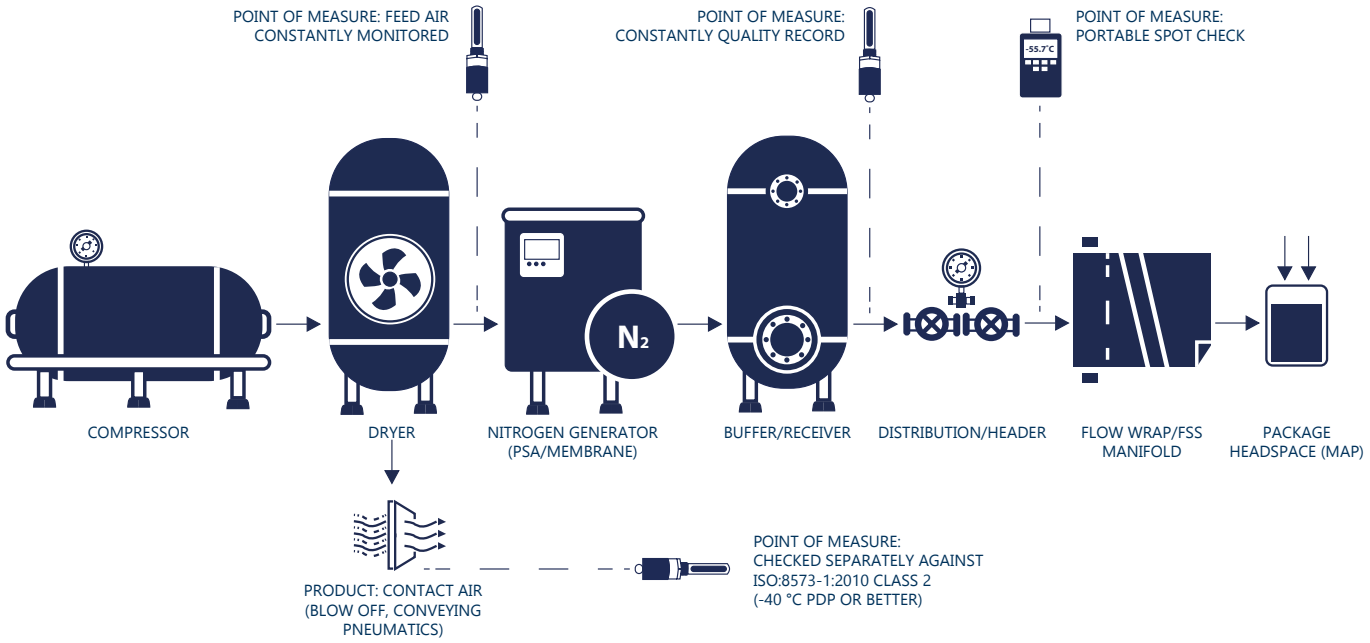
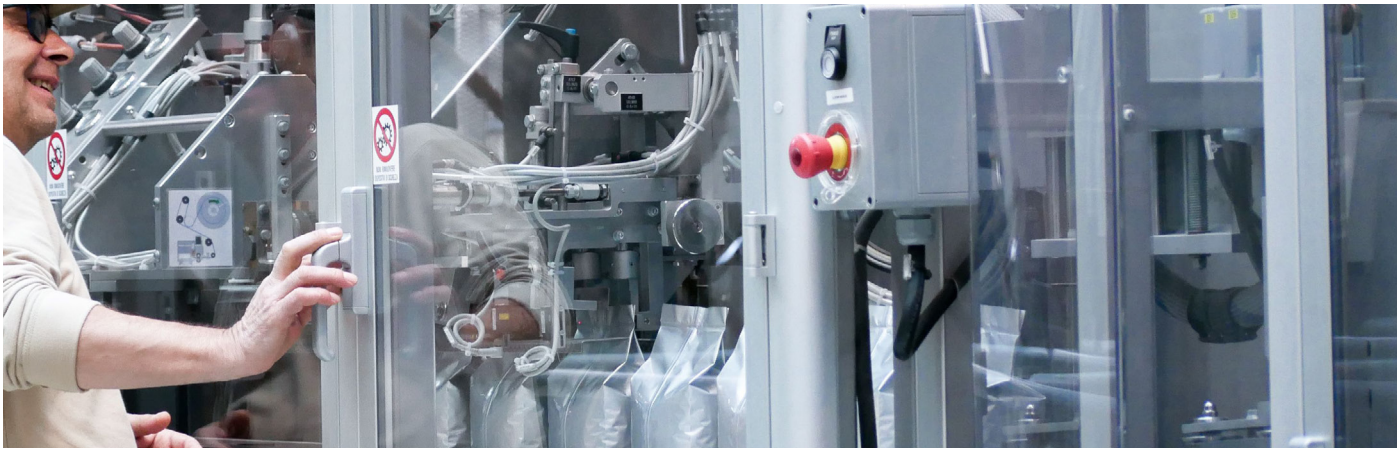


Figure 1. Compressed air and nitrogen path from generation to the packaging line for a site generating nitrogen on site, with dewpoint measurement points marked at the generator feed, the distribution header and the flow wrap manifold. Direct product contact air is checked separately against ISO 8573-1:2010 Class 2.

Measuring Moisture in Food Packaging Gas Systems

Measure at more than one point. A single reading at the nitrogen generator confirms the gas was dry there, at that moment. It does not confirm the gas is still dry once it reaches the flow wrap manifold.

That gap matters because the run between the header and the manifold is exactly where moisture gets back in. A quick connect coupling, a hose left open between production runs or a manifold opened for changeover can let ambient moisture into a line that read dry at the header. A distribution run through a colder part of the plant adds a second risk. If the pipe wall there drops close to the gas's own pressure dewpoint (PDP), condensation can form, even though the header read comfortably dry upstream. Checking only at the generator or the header misses both failure modes.



Typical Measurement Locations

Dryer Outlet and Generator Feed Inlet

Continuous monitoring here catches a failing refrigeration or desiccant dryer before wet feed air degrades the CMS bed. That protects both the generator and the nitrogen purity it delivers downstream.

Nitrogen or CO_2 Distribution Header

A continuous reading leaving the buffer receiver is the ongoing quality record for the whole packaging hall. It is also the figure a GFSI audit will ask to see.

Individual Flow Wrap or FFS Gas Manifolds

A portable spot check at the point of use confirms the gas is still dry when it reaches the package. Check especially after a long or exposed distribution run and at every line changeover.

Direct Product Contact Air

Check blow off, ingredient conveying and packaging machine pneumatics that touch product or product contact surfaces against ISO 8573-1:2010 Class 2, a pressure dewpoint of -40 °C or better.

SHAW's aluminium oxide dewpoint sensors cover this whole range from one sensing technology. The desiccant dry down chambers feature in the portable dewpoint meters give a fast enough response for a walk round of several packaging lines. Between full laboratory recalibration, AutoCal offers a quick check that requires no special equipment.

Summary

Accurate dewpoint measurement turns a compressed air or nitrogen system from a utility into an active part of food safety and shelf life protection. Measuring at the generator, on the distribution header and again at the point of use is what actually prevents mould, caking and texture loss. A single reading at the source cannot rule any of that out.

References to Applicable Standards

Applicable standards for food packaging gas quality.

ISO 8573-1:2010

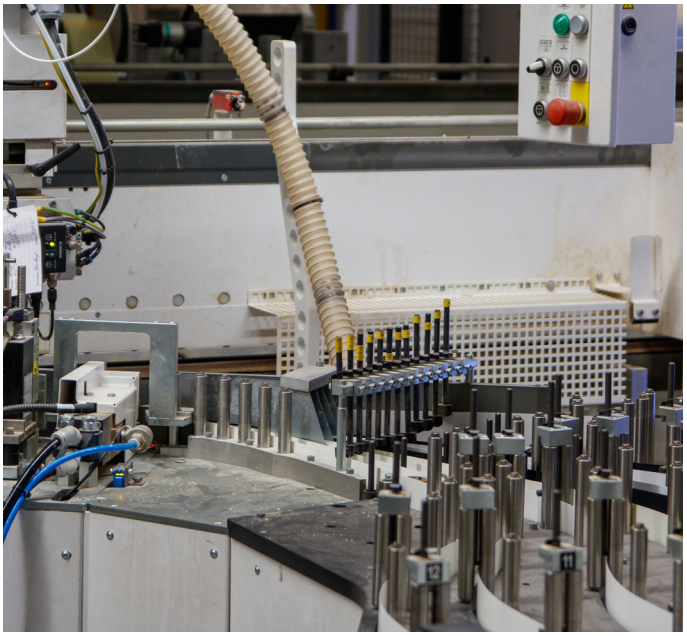
Compressed air, contaminants and purity classes, including the water/dewpoint classes (Class 2, pressure dewpoint of -40 °C or better, for direct food contact; Class 4, +3 °C, for indirect contact).

EIGA Doc 126/20

Minimum specifications for food gas applications, covering nitrogen (E941) and carbon dioxide (E290) as food additives, including moisture limits.

SQF Guidance, Apr 2023

SQF's "Air and Other Gases" Guidance Document (April 2023), referenced by GFSI-benchmarked audit schemes, on monitoring compressed air and process gases in food production, including moisture testing considerations.



Suitable Products



Dewpoint Transmitters

Intrinsically safe, continuous online monitoring for dehydration outlet and custody-transfer points inside a classified hazardous area, wired into a control system on a 4-20 mA loop.



Handheld Hygrometers

Handheld spot-check meters for commissioning, troubleshooting and periodic verification at remote or unmanned stations, using the same aluminium oxide sensing and AutoCal function as the fixed instruments.



Sample Systems

Sample conditioning built for line pressure natural gas, with a heated pressure reduction stage, filtration and hazardous area certification, matched to the transmitter or hygrometer in use.

Talk to our applications team

We design and manufacture dewpoint instruments for many different applications. Tell us about your application and we will help you choose the right product for your pressure, your hazardous area rating and your dewpoint range.

+44 (0) 1274 733582 or **enquiries@shawmeters.com**

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