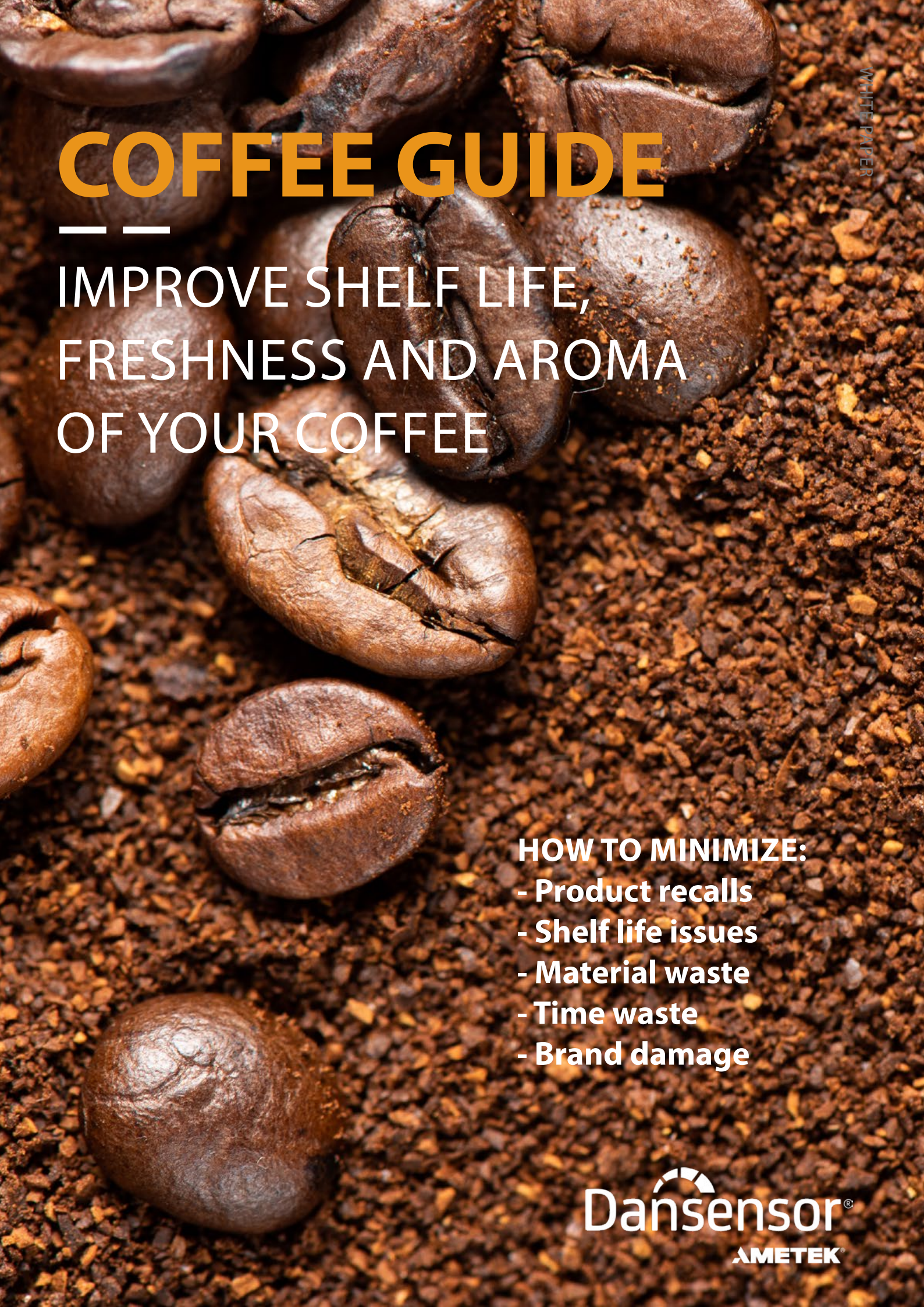


WHITE PAPER

COFFEE GUIDE

IMPROVE SHELF LIFE, FRESHNESS AND AROMA OF YOUR COFFEE

HOW TO MINIMIZE:
- **Product recalls**
- **Shelf life issues**
- **Material waste**
- **Time waste**
- **Brand damage**

Dansensor®
AMETEK®

WHY WE MADE THIS GUIDE

A coffee consumer's overall experience is influenced by many aspects of the coffee production process.

Starting with high quality raw green coffee beans, factors such as storage conditions, roasting, grinding, packaging, transportation, and finally brewing, all influence the consumer's experience. But there are also other important influences, such as social, cultural, psychological and situational factors.

However, there is one very crucial factor that makes or breaks the quality of your coffee – the packaging.

This is where we can help.

We have written this guide to share our knowledge and to invite you into a dialogue. So make yourself a good cup of coffee and enjoy the read.

The consumer has the final word. You can't cover up insufficient quality control. We challenge you to improve your setup with proven and trusted solutions and industry leading products.

THE ROASTING

Modern consumers are looking for high quality products. Therefore, to protect brand reputation and remain competitive, it is vital for coffee producers to maintain high quality standards across the entire production and distribution chain.

Let's have a quick overview of a typical coffee production plant. Three processes are needed to convert green coffee beans into our favourite cup of coffee: roasting, grinding and brewing.

Roasting confers each coffee blend its own particular aromatic and organoleptic profile; beans are treated at high temperature of up to 230 degrees Celsius for 12 to 20 minutes.

Heating the beans induces transformations that produce highly complex components and aromas. The heat influences more than 800 different substances in the coffee beans.

Roasting also leads to physical change in the coffee beans like weight loss (between 15 and 20%), volume increase (between 40 and 60%), change in structure (increased porosity), and of course, color change.

During roasting, the coffee produces a large quantity of carbon dioxide which is important for the creation of the typical espresso coffee crema. CO_2 is formed from the decomposition of carbohydrates and other chemical reactions. The emission of CO_2 has a very important consequence during the packaging stage.

The roasting challenge: Heat produces highly complex components and aromas - from more than 800 different substances in the beans.

PACKAGING AND GRINDING OF ROASTED BEANS

The coffee beans are cooled down before moving to the next steps: direct packaging of whole roasted coffee beans or grinding.

Roasted beans, because of the fact they are porous, absorb a CO_2 which is released when the roasted coffee beans are crushed during the grinding process.

The ground coffee will continue to emit CO_2 for several days after it is roasted.

The emission of CO_2 is not a deterioration process, it is a side effect of roasting, but it is very important to monitor its evolution over time. Depending on the final packaging solution, it may be necessary to implement an additional step, a degassing process, to avoid the undesired ballooning effect of the packaged coffee.

This can particularly be an issue during the product's shelf life, if the package undergoes temperature fluctuations during storage and transport.

The degassing process

There are a lot of different approaches and theories about the perfect degassing process – we want to remove CO_2, but at the same time retain aroma. Since there are many variables to consider, it is very challenging to define one specific rule or a general procedure to efficiently degas all the different types of coffee blends.

Let's take a different approach. What if you could monitor the emission of CO_2 and the residual O_2 content during every single stage of the degassing process, so that you knew precisely when it was time to pack your coffee?

Carbon dioxide is your friend.
Shelf life depends on avoiding O_2.

It's what you want to avoid: the ballooning effect.

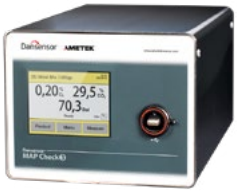
The solution

*We offer the right solution with **Dansensor® MAP Check 3** on-line gas analyser:*

You can continuously monitor CO_2 and O_2 directly in the headspace of your degas silos, store data and build your own statistics and graphs. Either transfer information to third party quality control management systems or integrate it to the PLC of the degasing system.

The Dansensor MAP Check 3 is also available with a multiplexer function, allowing it to monitor up to 3 sampling points simultaneously.

With on-line CO_2 monitoring, you will optimize your production, reduce downtime, protect the aroma and avoid the ballooning effect on your coffee packages.



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PACKAGING: THINK BEFORE YOU CHOOSE

Now it is time for the coffee to leave production and be packaged to meet consumers.

The right packaging solution is vital for allowing protecting the product during transportation and handling, from mechanical shocks, delivering a message and communicating information to consumers. But most importantly, it must preserve the aroma and the original freshness and flavor during its entire shelf life.

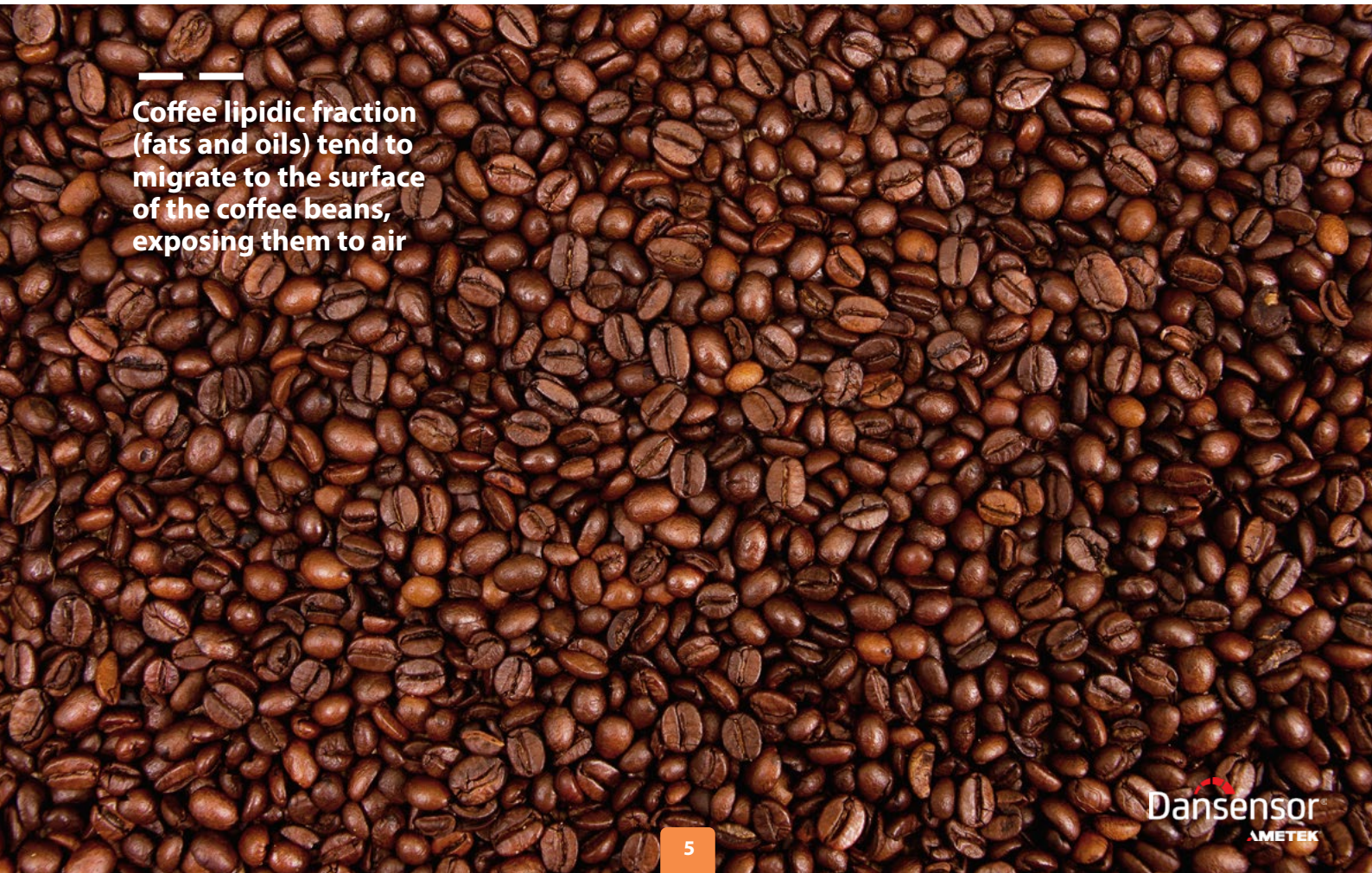
Packaging: Think before you choose

As mentioned during the roasting phase, coffee beans increase in volume, become more porous and hygroscopic (absorbs humidity) and the coffee lipidic fraction (fats and oils) tend to migrate to the surface of the coffee beans, exposing them to air.

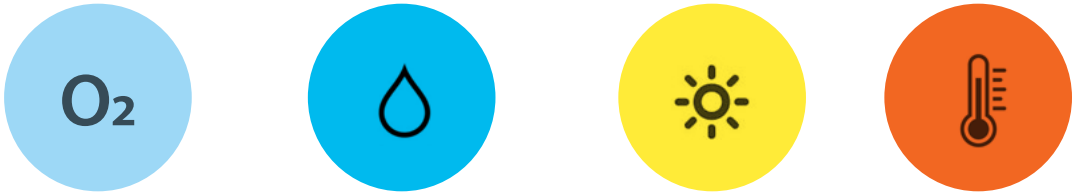
When in contact with air (O_2), fats oxidize, which in turn makes them stale and rancid. This reaction is accelerated by light, heat and humidity.

These are critical points to consider when choosing suitable packaging for your coffee.

The right packaging solution is vital



O_2 IS THE NUMBER ONE ENEMY – BUT NOT THE ONLY ONE



Air | *Humidity (water vapour)* | *Light* | *Heat*

Ground coffee has a greater surface area than whole beans and is, therefore, even more sensitive to O_2 exposure

THE RULE OF TWO – PRESERVING AROMA

There are many different packaging solutions for ground coffee. Typically these are metal cans, hard packs, soft packs – like pouches and pillow packs – or a variety of different single serve coffee pods and capsules.

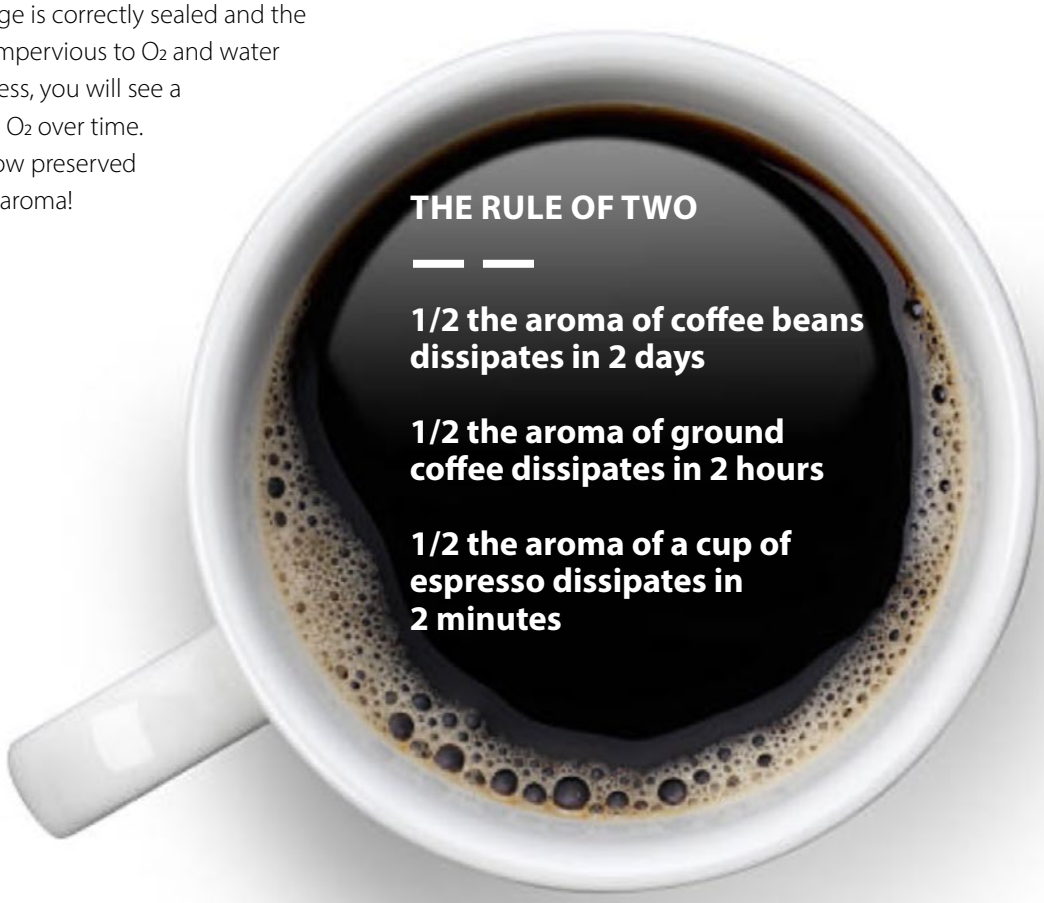
For most of these packaging solutions, the reduction of O_2 content inside the package immediately prior to sealing is best achieved by flushing the coffee with inert gases, commonly N_2, CO_2 or a mixture of these, or by a combination of vacuum and flushing with inert gas.

Quality Managers are responsible for implementing standardized protocols to measure the residual O_2 in the headspace of the finished packages, to verify seal integrity and perform leak tests. Remember that O_2 is also partially absorbed by ground coffee. Therefore, even if you measure a very low residual O_2 in the head- space of your package at time zero (immediately after packaging), expect a slight increase of O_2 during the following hours. In addition there will be emission of CO_2 and CO (as a consequence of the roasting process).

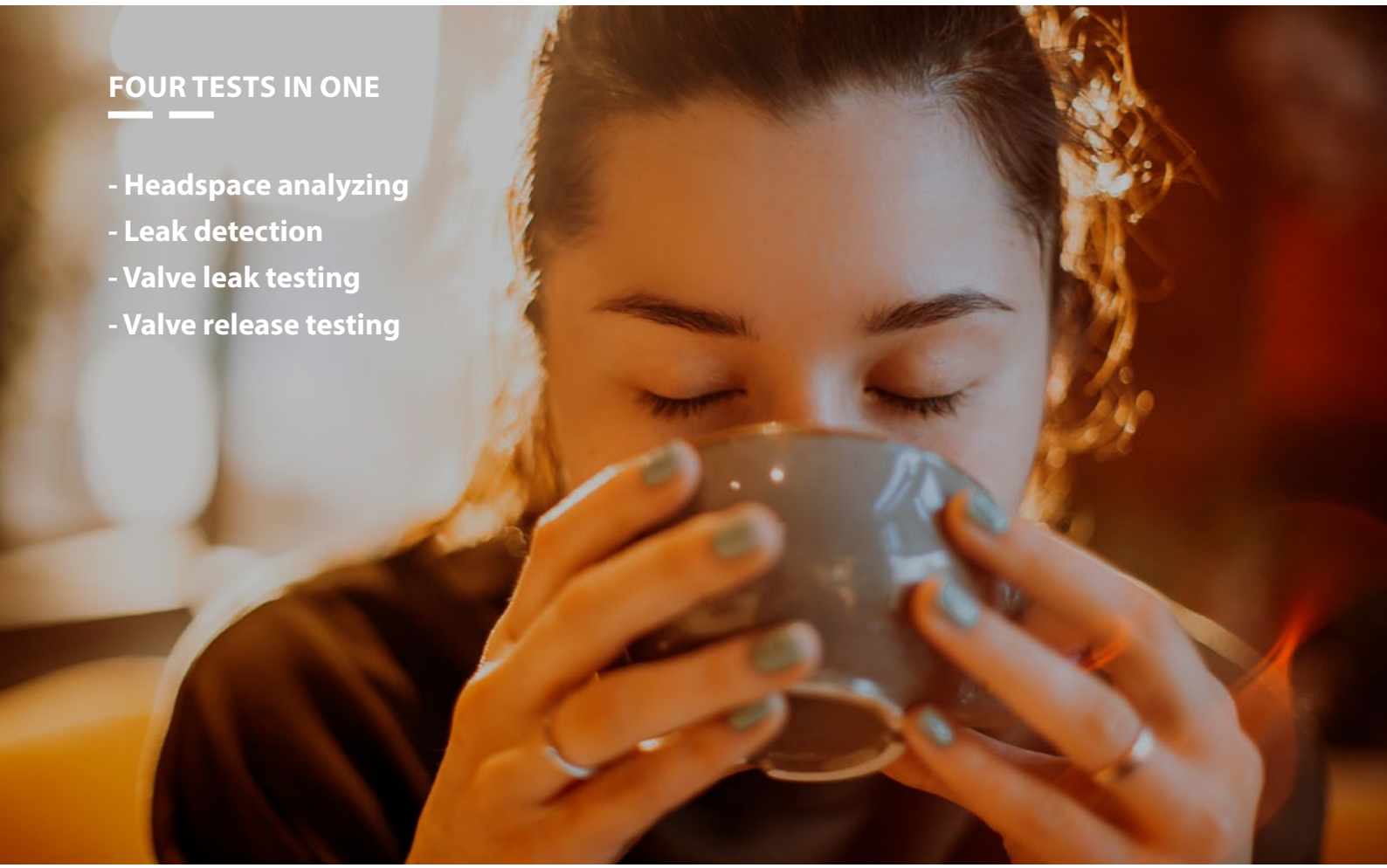
If the package is correctly sealed and the material is impervious to O_2 and water vapour ingress, you will see a decrease in O_2 over time. You have now preserved your coffee aroma!

Dansensor-headspace analyzers provide a variety of solutions for Quality Managers. We can help you define which analyzer is the best fit for your company by looking at variables like headspace volume, accuracy, repeatability, and your data transfer and storage requirements.

Both the CheckMate and CheckPoint are equipped with accurate and reliable sensor technology, combined with a modern, user-friendly interface. Available in several variants, there is a model to suit almost any application, including accurate analysis of small volume headspace, like coffee pods and capsules.



PREMIUM COFFEE EXPERIENCE = PREMIUM QUALITY CONTROL



FOUR TESTS IN ONE

- Headspace analyzing
- Leak detection
- Valve leak testing
- Valve release testing

The premium solutions for Quality Control

Dansensor MultiCheck® 2 - developed coffee packers

With the ability to conduct four tests in one – headspace gas analysis, valve leak/release and leak detection – the Dansensor MultiCheck 2 is fast, reliable, accurate and easy to operate for non-lab skilled operators.

Designed for easy maintenance with a self-rinse program and replaceable filters, it ensures the accuracy of your measurements and maximizes uptime.

Multiple benefits:

- Complete MAP quality control for coffee packaging
- Protects your brand and product
- Maximizes uptime with quick and reliable package testing
- Easy to use
- All-in-one integrated solution for faster procedures
- Reduces risk of human error
- Saves time troubleshooting

Dansensor AMETEK

THE PACKAGING LINE – QUALITY CONTROL AND AVOIDING WASTE

Let's take a closer look at the packaging line.

Packaging lines are becoming more and more efficient, sophisticated and fast. Some can produce more than 1.000 packages per minute.

Imagine that the Quality Manager implements an internal procedure to test 5 samples every half hour. Now let's assume the operator on the line discovers a package with a residual O_2 content that is too high during one of the routine tests.

How can the operator can be sure that all of the additional packages produced during the previous 30 minutes are within predefined O_2 limits?

To destroy or not to destroy

Quality is in jeopardy and the operator has to decide whether or not to destroy or repackage the entire batch.

Remember the high production speed?

You do the math - do you destroy the entire batch or risk a potential recall? In either case, it is an incredible waste of material, product, time, gas and more.

The solution: Integrate a preventive approach by implementing quality assurance control measures directly on your packaging line. This way you can continuously monitor the residual O_2 in a non-destructive way, checking 100% of the packages you produce. And in the case the O_2 level reaches your pre-determined limit, the analyser will sound an alarm or automatically stop the packaging line, avoiding the production of non-compliant packages. Our on-line gas analysers are also available with a GasSave function. GasSave modulates the gas flow according to the O_2 measured. It can increase or decrease the flow automatically, saving up to 30% of your gas usage.

Destructive and frequent head space quality control tests equals wasted time and materials. We offer non-destructive, intelligent solutions that will save you material, gas and time.

The solutions for Quality Assurance

Dansensor MAP Check 3 - *On-line continuous gas analyzer designed to precisely monitor gas content on vertical and horizontal flow packaging machines. Combines gas content analysis with real-time control of package flushing, which for most manufacturers results into a decrease in gas consumption of 20-50%.*

Dansensor MAP Mix Provectus® - *Gas blending system provides a smarter way to mix MAP gas. Relying on an innovative mixing principle, it provides advanced reliability and sets new standards for user-friendliness, compared to similar products on the market. It constantly notifies operators with vital information such as the current gas flow, total gas consumption and actual MAP gas mix.*

LET'S HAVE A QUALITY COFFEE MEETING

Ensure the safety of package systems and the products they protect

Packed products experience many potentially damaging forces from production until they end on the shelves. Therefore, it is vital to test your package in real-world conditions to ensure a package with the highest integrity.

A sub-category of quality control, package integrity testing encompasses testing of leak, seal strength, burst, and the permeability of barriers. These tests are used to protect your product against recalls and secure the best possible shelf life.

Proven solutions and technology

At AMETEK MOCON we are a leading supplier of packaging integrity testing equipment which detects leaks and pinpoints seal integrity challenges. With our package integrity equipment, we help packaging designers, brand owners, production managers and manufacturers deliver safe products quickly and cost effectively. With more that 50 years in the business, we have solid experience meeting the needs of the food & beverage industry, as well as the medical and pharma industries where contamination poses a safety and health risk. We are experts in MAP and can advise on all applications where physical stresses, microbiological growth and chemical exposure create challenges with shelf life and customer satisfaction.

We'd like to hear from your

AT AMETEK MOCON, our support, service, and application teams are available to assist you. Get in touch to learn more about how our solutions can support your packaging integrity testing process taking you one step ahead of the competition.

CLICK HERE!

Get in touch with a MAP expert

Dansensor®

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