



# Sector Booklet Coffee



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# How to Minimize Rejected Goods

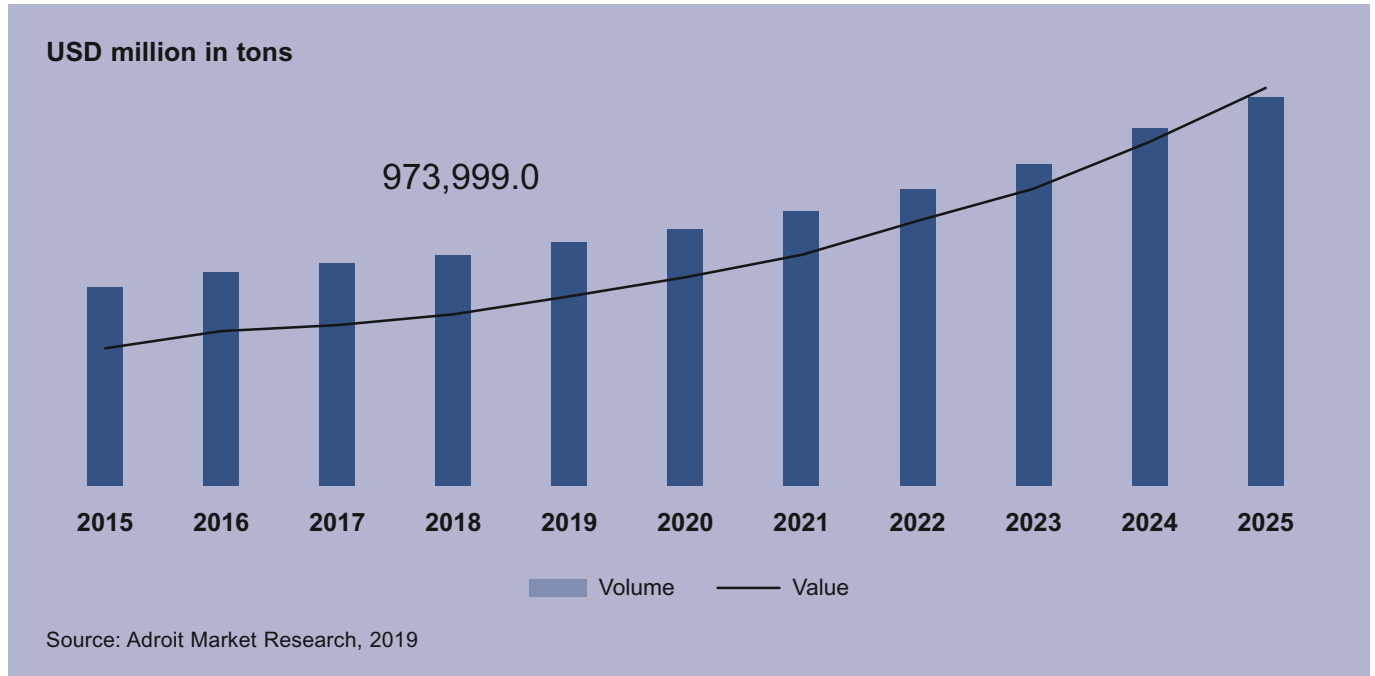
## Achieving excellent packaging performance

When it comes to coffee, even a tiny leak will lead to oxidation and a crucial loss of aroma and product quality. Therefore, reliable packaging performance is key. Yet there are other critical factors that can affect retail and customer loyalty. These factors can have a decisive influence on the packaging, such as an ever-expanding shelf life, longer transport distances and an increasing demand for brands to work with sustainable, more delicate packaging materials. One proven strategy to cope with these constantly evolving market challenges is to minimize leakage by establishing a reliable quality management process with systematic non-destructive leak detection.

Although still a niche product, the expansion of specialty coffee with a minimum cupping score of 80 to 85 is an indicator for a growing consumer quality awareness. By the year 2025<sup>1</sup>, the global specialty coffee market is estimated to reach 83.6 billion USD in revenue. However, for protecting your coffee's aroma against external factors including oxidation, moisture build-up, and temperature there are various factors to be considered.

### Global Specialty Coffee Market

With around 1,000 volatile identified aroma compounds in coffee, the complex and delicate flavor profiles are what all coffee consumers look for. The intrinsic reactivity of aroma compounds, a significant deviation of taste and freshness can be attributed to volatilization of aroma molecules which react with CO<sub>2</sub>. The fruity, buttery, caramel-like taste notes are the most volatile aroma components. Accordingly, after the roasting process especially coffee has to be protected from quality deterioration to avoid "off-notes" or a lack of freshness from oxidation, especially for the high-profile coffees.<sup>2</sup>



<sup>1</sup>Adroit Market Research, 2019.

<sup>2</sup>Yeretizian, Chahan & Blank, Imre & Wyser, Yves. Protecting the Flavors – Freshness as a Key to Quality, 2017.

### Shelf life vs. sustainability: Why leakage should be monitored

Both flexible packaging and coffee capsule manufacturers face the same challenges when it comes to assuring consistent taste, smell, appearance, and nutritional values of the product. They also all strive for always-longer shelf life, which has become a competitive factor. Consequently, manufacturers give an objective and comparable quality guarantee that they must have complete confidence that this promise will not be undermined by inferior or damaged packaging.

On the other hand, packaging materials are evolving as fast as the circular economy movement grows. For many years, aluminium had to be included in the packaging to keep the seal tight. However, recyclability and reliable barrier properties aren't mutually exclusive anymore. Thanks to extensive research in polyethylene and biodegradable materials, coffee packaging reflects more and more the conscious mindset of its connoisseurs. But while materials are more sustainable than ever, some tend to be more fragile and prone to leaks than others. Also, the manufacturing processes got more complex, so it is advisable to have a close eye on malfunctions which lead ultimately to leakage, rejected goods and waste of product and money.

### A closer look at the packaging surface

The microscopic tightness of the packaging material plays a central role in the package's shelf life. It decides whether the packaging really does justice to its protective function. Larger surface pores and micro-cracks may occur in the packaging film during thermoforming or through overstretching. Ruptures might happen in the expanding package due to the natural degradation of gas inside the coffee. Product residues in the welded seam or an incompatible adhesive quickly lead to fine, difficult to detect capillaries. Excessively large pores can promote the entry of atmospheric oxygen and moisture, and rapidly increase the CO<sub>2</sub>-concentration inside the package (figure 3).

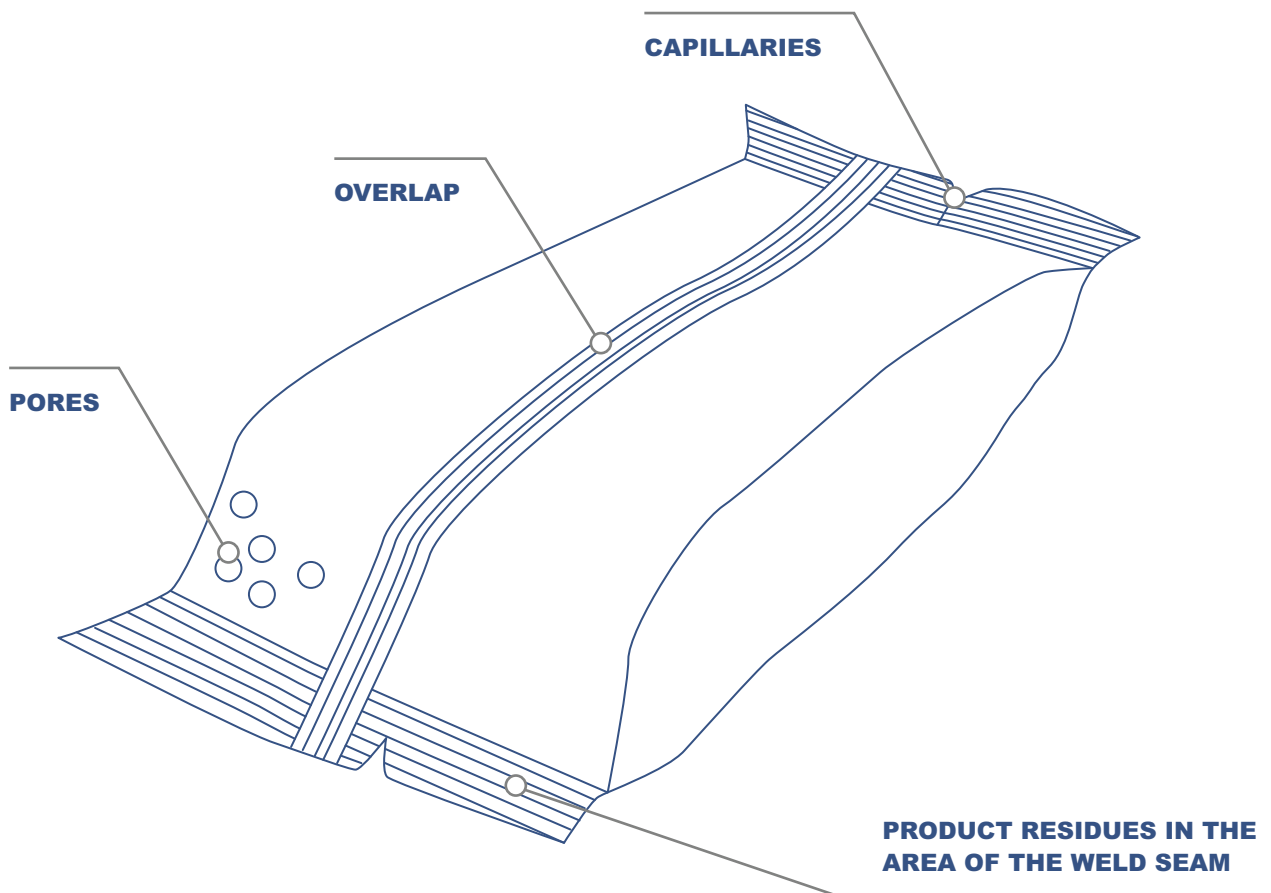


Figure 2: Graphical representation of the most common weak spots of packaging: Pore size, poorly sealed welds, and too narrow overlaps.

In order to prevent oxidation, food producers nowadays often work with special protective gases that contain a very small amount of oxygen. However, if the packaging has a leak, the concentration of a protective gas changes because the oxygen in the air diffuses unhindered into the packaging. In addition, if pores are only about one micrometer, bacteria can penetrate within a very short time.

### Rise in oxygen concentration due to leaks

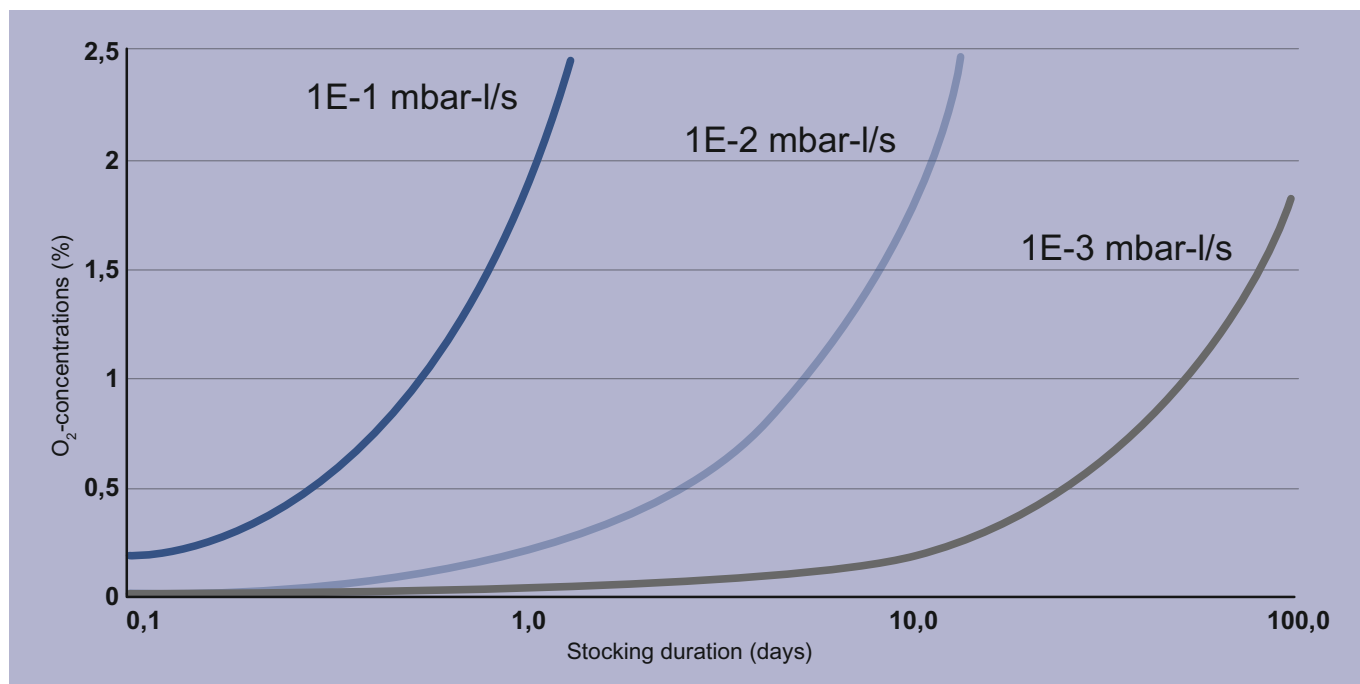


Figure 3: Starting point: Residual oxygen concentration of 0.5 percent in a package, Representation of the increase of oxygen as a function of the storage time and the level of the leak rate.

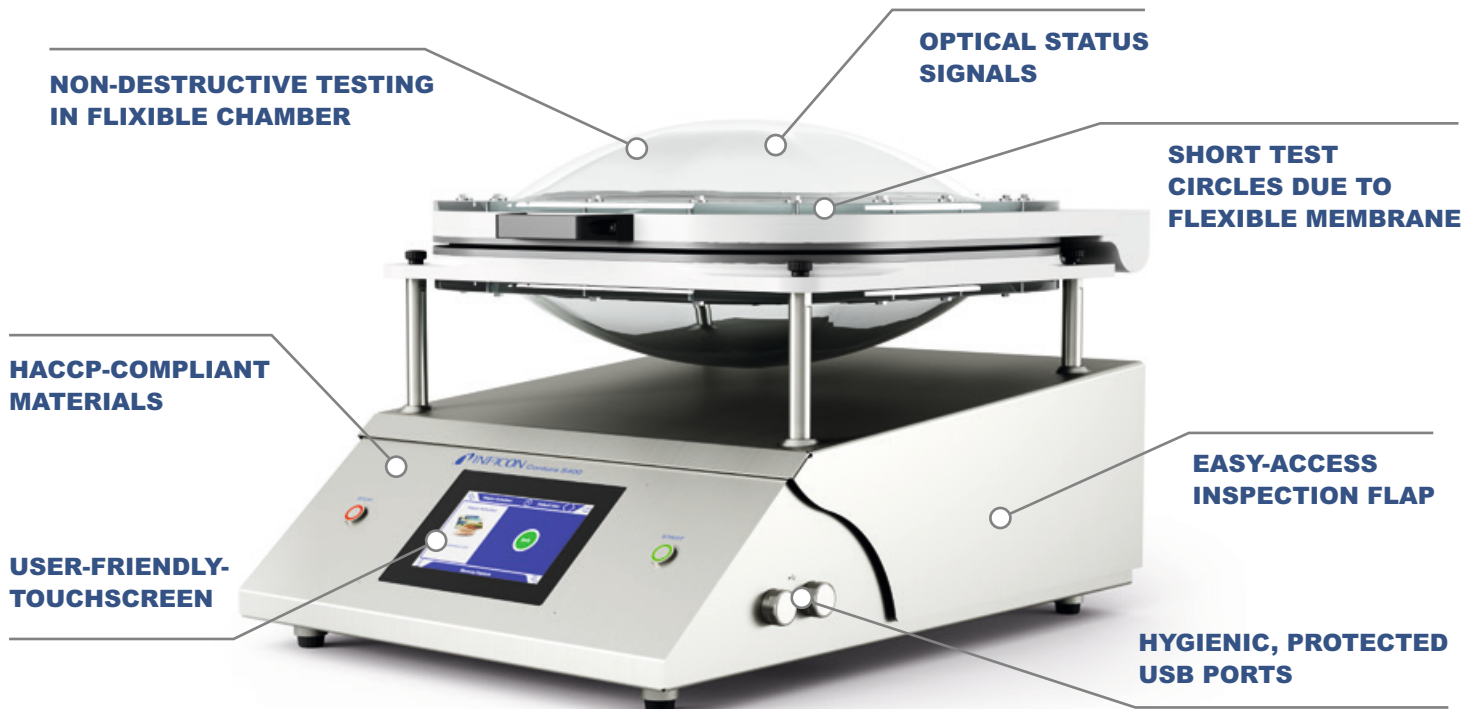
### Reliably detect leaks of relevant sizes

It is obvious that destructive testing methods, where ground coffee could enter and contaminate the testing chamber, is not an option. Leak detection is most efficient if workers are able to uniformly carry out leak tests directly on the running production line. With the pressure increase method inside a flexible membrane chamber, both fine and gross leaks can be reliably detected during a production run. For measuring, the package to be tested is located between two highly elastic membranes in a test chamber. By evacuating the chamber, the membranes adapt to the contour of the test object, and a large pressure differential is created between the packaging and the vacuum inside the test chamber walls. This pressure differential inspires gas to escape from the packaging through existing leaks and causes a measurable pressure to rise in the vacuum chamber. These leak detectors can detect leaks that are smaller than 10 µm. In addition, this method – unlike other systems – also reliably detects gross leaks.

### The Contura® Series: Quality assurance in ongoing production

With the innovative Contura® Leak Detector series, INFICON offers a unique solution for detecting leaks in capsules, MAP (modified atmosphere packaging) and other flexible packages. Flexible membranes, conforming to the package, absorb the mechanical stress created by a large differential pressure that otherwise would be applied to the sealed seams, resulting in a high destruction and contamination risk. This mobile stand-alone solution provides the operator with immediate testing results without damage or contamination to the package being tested. The status display on the acrylic cover as well as the touchscreen display on the front of the instrument indicate the packaging quality by color and sound signal. This is particularly useful in noisy and busy production environments. The statistical display also shows the exact leak rate which can be easily exported into the network or readout via USB ports for subsequent processing, thus contributing to the continuous improvement process (CIP).

For efficient integration of a testing device into the production process, Contura features short test cycles, as well as quantitative and reproducible results. All of that pays off significantly in terms of quality assurance and cost-efficiency. It is also possible to use the test results for the further development of packaging materials and machines.



### CONTURA ADVANTAGES

- Mobile, versatile stand-alone solution without tracer gas
- Reliable leak detection (size < 10 µm) within seconds
- Detection of gross leaks even in packages with little headspace
- Sampling of individual, multiple MAP or other flexible packages, also capsules
- Immediate display on touchscreen of measurement results
- Storage and evaluation of measurement results
- Simple and HACCP-safe cleaning and maintenance
- DIN ISO design, certified documented output inspection

### CUSTOMER BENEFIT

- Maximizing shelf life
- Avoiding customer dissatisfaction and complaints
- Saving money by reducing product returns and waste
- Producing more sustainably
- Improving the quality control process
- New business opportunities with longer shelf life

### Leak detection e-book for free

Further information can be found in the e-book "Leak Detection in the Food Industry." Delve deeper into the greatest threats to the shelf life of various types of food and beverages, whether dry, semi-dry or moist products. This e-book also provides an overview of the leak detection methods commonly used in the industry and assesses their informative value and reliability. The e-book is free to download.



Learn in this **short clip** all about leak detection with the Contura S-Series.

### Inspired by Visions, Proven by success

INFICON plays a crucial part in ensuring the highest possible quality and maximum safety in production processes. As a reliable partner in the development and manufacturing of high-quality leak detectors, INFICON is able to offer innovative, high quality solutions that will ensure lasting success thanks to many years of experience in leak detection and the food and packaging industries.

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