

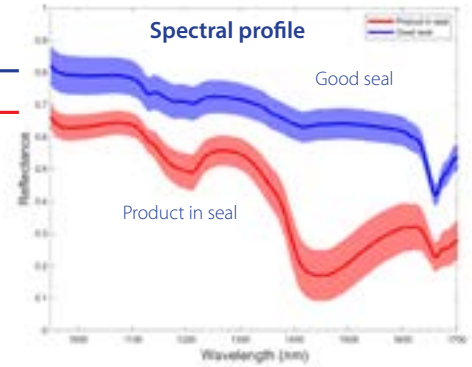
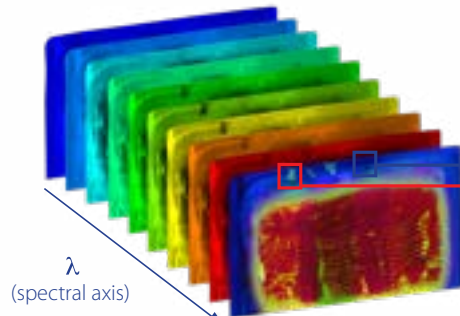
## HYPERSPECTRAL SEAL INSPECTION OF PLASTIC FOOD TRAYS & THERMOFORMING

INNOVATIVE IMAGING TECHNOLOGY EASILY DETECTS  
SEAL CONTAMINATION, EVEN THROUGH PRINTED FILMS



Contamination in the seal of rigid plastic packages causes important issues for food producers as it may lead to leakage and consequently reduced shelf life, health issues and even expensive recalls with potential brand damage. As such automatic detection of contaminated seals is important for both food safety and production automation. Engilico, specialist in in-line seal inspection for flexible packaging, now introduces its newly developed seal inspection solution for rigid trays, pots and thermoforms sealed with plastic film.

The **HyperScope™** solution is based on hyperspectral imaging (HSI). This technology enables to obtain images with much higher contrast than traditional vision systems and can even detect contamination through printed films. Typical applications are the in-line inspection of trays with meat, cheese, fruits, ready meals, snacks, etc.



A standard camera image is built from 3 wavelengths ranges (RGB) and only provides visible information

The hyperspectral 3D spectral image map is built from hundreds of images in different wavelength bands. Every pixel is analyzed individually and differences in materials or composition can be detected, even through printed film. A point or region with contamination has as a different spectral profile points where the seal is correct.

One of the main concerns in the packaging industry is to avoid leaking of open packages. Defective packages have a vast impact on outgoing product quality and productivity, as sealing issues may induce extra costs due to line stoppage, manual re-packaging or machine cleaning. For inspection of flexible packages such as pouches, flow wraps and VFFS bags, Engilico already offered **Seal-Scope™**, an in-line, 100% seal inspection sensor-based solution. But many – and often the same – food manufacturers use also rigid trays, pots and other thermoformed packaging, and they have a similar need for seal inspection of these packaging types. This why Engilico developed **HyperScope™**, an innovative system based on hyperspectral imaging, to detect contamination in seals of thermoformed packages.

### Seeing more with hyperspectral imaging

Product in seal often causes issues for standard vision systems, as there might be not enough contrast between the plastic film and the contamination. In case of printed packaging, often used in more luxury packaging, the contamination can even not be seen. An alternative is X-ray inspection, but this technology is expensive and is only efficient in case the material density is sufficiently different to reveal the distinctive materials, which is not the case for contamination of organic materials such as meat, cheese and vegetables.

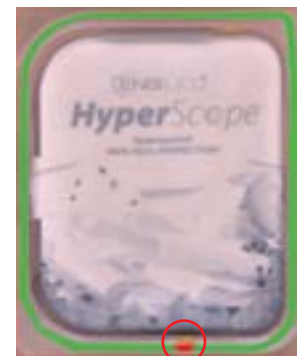
A solution to overcome these challenges is hyperspectral imaging. A traditional vision camera provides a single image with spectral information from the three primary colors (RGB). Hyperspectral camera technology results in hundreds of images, each with information of a specific wavelength range, including infrared wavelengths. For the detection of contamination in the seal, the relevant wavelengths are merely situated in the (near)-infrared region.

As different materials react uniquely to infrared light, they can be reliably detected based on their specific transmission, reflection and absorption properties. Since hyperspectral imaging delivers the spectrum for each pixel in the image, it provides information about the chemical composition of the measured sealing area. As such hyperspectral imaging allows to distinguish with high contrast undesired materials such as meat, fat, oil from the plastic film. Also, because infrared light penetrates the top film, contamination can be detected through printed top film.

### In-line, 100% inspection

The hyperspectral system is directly integrated in the food production line, checking up to 160 packages per minute. Every package is inspected and the system issues a signal to an ejector to reject packages with seal issues. The “core” of the **HyperScope™** system is situated in the software controller that instantly processes the hyperspectral image to recognize the package regardless of its orientation, and to analyze the seal quality. All information is displayed on an operator-friendly touch screen to provide feedback on every package. All production related data, such as product type, number of good/bad packages, date, time is saved to monitor the production quality.

In general, in-line seal inspection enables customers to realize better packaging quality, higher packaging productivity, end-of-line automation and reduction of manual inspection.



**Visual image**  
When product and film have similar colors (yellow-on-yellow), contamination in the seal is not visible

**Hyperspectral image**  
The higher contrast clearly reveals contamination (red) in the seal (green mask)

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