



TapTone

APPLICATION NOTES

News and information from Teledyne TapTone, a leader in the package inspection industry.

Leak detection in hot filled plastic containers

Tested: Hot Filled Plastic Beverage Containers

Tested with: TapTone 4000 Compression and TapTone 4000 Dual Sensor Compression (DSC) Systems.

The purpose of the test was to prove the effectiveness of the TapTone T4000 Compression system and the TapTone T4000-DSC, Dual Sensor Compression System in inspecting hot filled plastic beverage containers.

Quality Control of hot filled plastic beverage containers can cause a challenge for beverage producers. Poor seal integrity can cause problems in the production process even before the container leaves the processing plant. Container designs can interfere with the inspection process.



Hot filled plastic container shapes and design variations (representative sample).

HOT FILL PROCESS

Hot filled product is typically filled at a temperature of 185 degrees Fahrenheit (85 Celsius) or higher. The containers are capped then inverted or laid on their sides for a period of time to allow the hot liquid to sterilize the closure. A container with a missing or leaking closure will spill product at this stage. As the hot container is cooled, liquid used to cool the containers can be drawn in through the leak path contaminating the contents of the container and giving the container the appearance of being properly filled.

CONTAINER DESIGNS

Hot filled plastic containers are designed with vacuum panels or rings in the body side wall. These panels or rings help the container hold its shape after the container has cooled and drawn a vacuum. The contour of the "H" panels or vacuum panels can interfere with the inspection process on some container designs. Containers with rings in the sidewall typically do not interfere with the inspection process.



Close up view of container design and geometry from photo above.



TECHNOLOGY CORNER *How it works*

The T4000-Dual Sensor Compression system finds and rejects leaking and damaged flexible bottles at production line speeds up to 250 feet per minute. The system is designed with dual parallel belts suspended over the customers' existing conveying system.

As the container passes through the system, the dual parallel belts apply force to the sidewall of the container. This action compresses the headspace of the container which allows a comparative measurement to be taken at both the infeed and the discharge of the system. Comparing the container to itself between the infeed and discharge of the system, eliminates typical variations seen in the production environment (Fill Level, Product Temperature, and Container Density).

Utilizing advanced DSP technology the T4000 controller analyzes the comparative measurement and assigns a merit value to each container. If the merit value is outside of the acceptable range, a reject signal activates a remote reject system.



T4000 Dual Sensor Compression (DSC) System. Sensor has a cantilever design that suspends over the existing conveyor.

TECHNOLOGY CORNER *How it works*

The T4000-C Compression Sensor utilizes dual parallel belts to apply force to the sidewall of a passing container. This action also compresses the headspace of the container which allows a sensor to take a pressure measurement at the discharge of the system. Utilizing DSP technology, the controller analyzes the measurement and assigns a merit value to each container. If the merit value is outside of the acceptable range, a reject signal activates a remote reject system.



T-4000 Compression Controller and Sensor. Sensor has a cantilever design that suspends over the existing conveyor.



TEST

Plastic Containers with Vacuum Panels

Plastic containers with vacuum panels can typically be tested with a T4000-Compression or a T4000-DSC. Testing is always done on the hot side of the production process while the container is hot and the plastic is flexible. Test results will be dependent on the process and the rigidity of the container.

Expected results would be:

Inspection System	Minimum Detectable Leak Size
T4000-C (single sensor)	.020 inch - .050 inch (.500mm - 1.270mm)
T4000-DSC (dual sensor)	.008 inch - .015 inch (.200mm - .381mm)



Plastic Containers without Vacuum Panels

Plastic containers without vacuum panels can be tested with a T4000-Compression or a T4000-DSC. Testing can be done on the hot side of the production process while the container is hot and the plastic is flexible. Depending on the rigidity of the container, testing may be done once the container has cooled. Test results will be dependent on the process and the rigidity of the container.

Expected results would be:

Inspection System	Minimum Detectable Leak Size
T4000-C (single sensor)	.020 inch - .030 inch (.500mm - .762mm)
T4000-DSC (dual sensor)	.006 inch - .015 inch (.152mm - .381mm)



Note: Closures that include a foil seal and plastic over-cap must have the over-cap removed or loosened (detorqued) enough to allow air from the head space to freely escape the bottle when a leak is introduced in the foil seal. Test results similar to those shown above can not be achieved unless this condition is met.



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