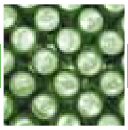
TELEDYNE TAPTONE
Package Inspection Systems
A Business Unit of Teledyne Benthos, Inc.

Volume 2, No.9




TapTone APPLICATION NOTES

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

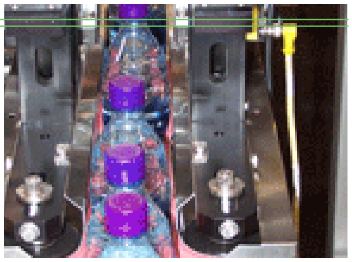
PRESSURE INSPECTION IN LIGHTWEIGHT PLASTIC BEVERAGE CONTAINERS.

Tested: Various size PET beverage containers.

Inspection Desired: Detect pressure variations in containers as a result of LN2 dose and container fill level.

This test was intended to demonstrate the effectiveness of the T4000-F in measuring accurate internal pressure in lightweight plastic beverage containers. Lightweighting can weaken container side walls, manufacturers must consider the integrity of the package during and after it's on the production line. Under-pressurized containers can jam vending machines, reduce shelf stability and impact sales negatively. Non-carbonated beverages in lightweighted containers require Liquid Nitrogen (LN2) to reinforce a container rigididity. LN2 keeps the integrity of a container until the seal is broken, the amount of LN2 must be matched to the container weight and content volume. Too much LN2 could bloat the container, too little and it could collapse.

Tested with: TapTone 4000-Force System with X-ray fill level option.



▲ Bottles of spring water pass through the belts of the TapTone T4000-F.

▲ LN2 Dosed containers

TECHNOLOGY CORNER *HOW IT WORKS*

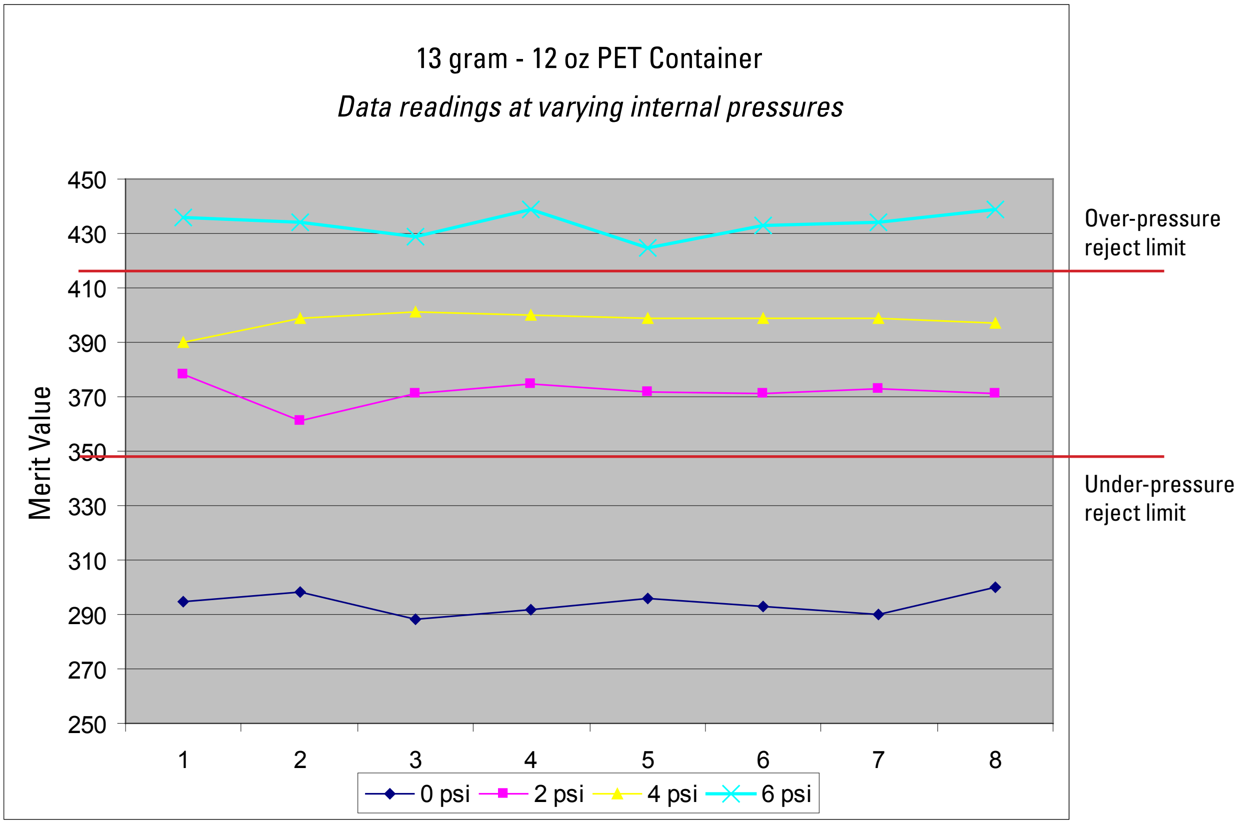
Force Technology: detects leaks and low pressure in LN2 dosed containers, carbonated beverage containers and aerosol containers. Parallel belts transport the container past a sensor that measures the tension on the sidewall of the container. This action allows the system to measure the pressure inside the container. 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 and the container is removed from the line.

X-ray Technology: The X-ray sensor is used to measure the fill level in steel, aluminum, glass, plastic and paper containers. An x-ray beam is focused in the expected fill level region of the container. As the x-ray beam penetrates the container, it is attenuated by the amount of product blocking the beam. The attenuation is proportionate to the fill level of the container.

Pictured at Right: (Top) T-4000-F Force Controller and Sensor with cantilevered design that suspends over the existing conveyor.

(Bottom) X-ray system.

Test Procedure: Various size containers were tested to determine the pressure variances that can be detected using the TapTone T4000-Force system. Containers were pressurized at 0 psi, 2 psi, 4 psi and 6 psi then run through the system multiple times to generate a baseline for each pressure level. The sensor located behind the soft belt measures the tension on the sidewall of the container. The greater the internal pressure, the higher the sensor reading. In the 12oz container test (see graph below), the desired internal pressure was between 2 psi – 5 psi. Containers below 2 psi would not have sufficient rigidity and were rejected. Containers above 5 psi were considered over-pressurized and could become bloated causing problems in down-stream processes including labeling and shrink wrapping. These were also rejected.



TapTone T4000-Force system was capable of detecting and rejecting containers that fell outside the desired pressure range.

TYPICAL LOCATION FOR THE TAPTONE T4000-FORCE INSPECTION SYSTEM

Testing of LN2 dosed containers can be performed directly after the capper. Liquid nitrogen expands immediately, allowing the inspection system to detect internal pressure just beyond the capper. One major cause of under pressurized LN2 dosed containers is the delay between the LN2 dosing head and the capper that can occur during a pause in production. The benefit to placing the inspection system just past the capper is should the LN2 doser fail, the inspection system will detect the failure and send a signal to the rejector to remove the undosed containers from the line. Features in the TapTone T4000-Force system software will send an output signal to an alarm or a line control system in the event of multiple consecutive rejects, a high percentage of rejects, or both. Alarm limits can be set by the operator.

LN2 dosing of a beverage container

OPTIONAL SENSORS

TapTone's optional sensors will aid in diagnosing where the failure occurred in the filling, dosing and capping process. On-screen production counters on the T4000 screen will display total production, total pass/fail, and the reason for the failure, provided the system is equipped with the optional sensors.

X-ray Fill Level Sensor

Maintaining consistent fill level is important in the LN2 dosing process. Nitrogen dosing systems can inject liquid nitrogen into a container in consistent and precise doses. When LN2 is added to an underfilled container, the container will have a low internal pressure due to the larger head space. By placing an optional X-ray fill level sensor just upstream of the Force system, the plant can easily trace the source of the defect back to the filler, rather than assuming all defects are related to the doser.

Cap Inspection Sensors

If the capper fails, or a cap is misapplied or cocked, the system will reject the container for that defect. By looking at the on-screen production counters, the operator can quickly determine what percentage of the rejects are related to the capper.

Did You Know

LN2 expands to 700 times its liquid volume!

Expansion occurs as soon as the gas hits ambient temperature air.

OTHER APPLICATIONS FOR TAPTONE FORCE TECHNOLOGY

LN2 Dosed:

- Dairy Based Products
- Cans Containing Non-Carbonated Beverages
- Tea or Juice - Hot Filled

Cans of Dairy Based products are retorted. After retort, the can end could have memory, leaving the end domed, even though the pressure has escaped. By using Force technology on the sidewall of the can, immediately after the retorter, slight differences in pressure are easily detected.

Hot Filled Juices and Teas will benefit from the Force System being placed immediately after the seamer. At this point the can end may be domed due to pressure from the hot product, regardless of the presence of LN2. By using Force technology on the sidewall of the can, slight differences in pressure are easily detected. A Force system can also be set-up with a consecutive reject alarm to alert an operator if multiple containers are rejected. This could indicate a problem with the LN2 doser.

Carbonated Beverages

- Carbonated Soft Drinks in Aluminum Cans
- Carbonated Soft Drinks in Plastic Containers

Carbonated Beverages can benefit from the Force technology provided the inspection system is placed down stream, in a location where the container has reached maximum pressure. On lines that include a warmer, the system is typically placed just down stream of the warmer. Can ends may sometimes retain their convex profile even after loss of internal pressure. This happens because the aluminum can stretch under due to high internal pressure that can occur in warmers or pasteurizers. By inspecting the tension on the thin sidewall of the can, pressure variations of as little as 2 psi can be detected.

Aerosol Cans

- Personal Care Products
- Edible Oils
- Air Fresheners

Aerosol Cans may be tested for presence or absence of pressure using the Force technology. As manufacturers move away from Liquefied Petroleum Gas (LPG) and Dimethyl Ether (DME) to more cost effective or eco-friendly propellants such as compressed air, nitrogen and carbon dioxide, traditional means of detecting propellant, such as check weighing are no longer viable. The Force system will detect internal pressure in an aerosol container by measuring the tension on the sidewall of the can.

◀ Edible Oil Aerosol Can

LN2 Dosed Dairy Product ▶

TELEDYNE TAPTONE
Package Inspection Systems
A Business Unit of Teledyne Benthos, Inc.

49 Edgerton Drive • North Falmouth, MA 02556 USA
P: +1 508.563.1000 F: +1 508.564.9945 E-Mail: taptone@teledyne.com