



# TapTone

## APPLICATION NOTES

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

### FILL LEVEL, IDENTIFYING SEAL DEFECTS AND BULL NOSE CROWN DETECTION IN CRAFT BREWERIES-PART 1

**Tested:** Glass Beer Bottles

**Inspection:** The purpose of this test was to prove the effectiveness of TapTone systems in determining fill level, seal integrity and proper crown attachment in beer bottles. By using a T550 interface connected to an X-Ray Sensor with an Acoustic Cocked Crown Sensor, these defects can all be found using one system. This level of inspection is critical for ensuring that no beer bottles reach the consumer without the highest quality.

**Tested with:** TapTone T550-RTV-X Ray Sensor  
TapTone T550-RTV-Acoustic and Cocked Crown Sensor



A bottle of beer with crown cap passes under the RTV-AC sensor.

### TECHNOLOGY CORNER *HOW IT WORKS*

#### FILL LEVEL INSPECTION: X-Ray Sensor With Beer Bottles

X-Ray technology is used to measure the product fill level in steel, aluminum, glass, plastic and paper containers. An X-Ray tube energized at high voltage is used to produce a low energy X-Ray beam. This X-Ray beam is focused to look through the container in the expected fill level region. As the X-Ray beam penetrates the container, it is attenuated by the amount of product blocking the beam. The beam is monitored by a scintillation detector, which counts the X-Ray intensity after it goes through the container. The level of intensity is proportionate to the fill level of the container. User set rejection limits defines the high or low fill threshold.

For the first inspection, five glass bottles of craft beer with proper fill levels were passed through the Fill\_xr sensor with one bottle intentionally made to represent a "bad" bottle with a reduced fill level. This series of tests clearly demonstrates the abilities of the TapTone T-550 Fill\_xr X-Ray sensor to identify and reject bottles with improper fill level.

TapTone  
Fill\_xr system

"Bad" bottle  
on X-Ray Sensor.  
Fill=475

"Good" bottle  
on X-Ray Sensor.  
Fill=732



# TECHNOLOGY CORNER

## HOW IT WORKS

### ACOUSTIC AND COCKED CROWN SENSOR-BEER BOTTLES AND CROWNS

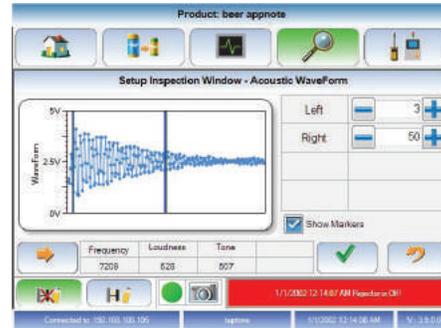
The acoustic sensor uses acoustic technology to measure pressure in beer bottles that do not have a measurable lid deflection. The acoustic sensor works by applying a “tap” to the top of each container. The “tap” is produced by a large electromagnetic pulse, which excites the container lid. The lid vibrates at a natural resonant frequency “tone” based on internal pressure. The resultant “tone” signal is sensed by a microphone, digitally sampled and stored in memory for processing. The patented Digital Signal Processor (DSP) produces a real-time signal spectrum and calculates the resultant frequency of the “tone” for that container lid. This frequency value is then compared to user set limits where containers with a frequency response outside these limits are rejected.

The cocked crown detector is an option with the acoustic sensor to increase the detection and rejection of damaged crowns. It works by measuring the crown curvature with an analog proximity sensor and comparing it to the curvature of a good crown. If the detector determines that the measured crown is outside of a predefined set of criteria, a reject signal is sent to the user interface to remove the bottle from the production line.

For this application review, several glass beer bottles were repeatedly tested on a loop conveyor. One bottle was made to be a “bad” bottle by bending the crown and pouring out 1.5 inches of product.

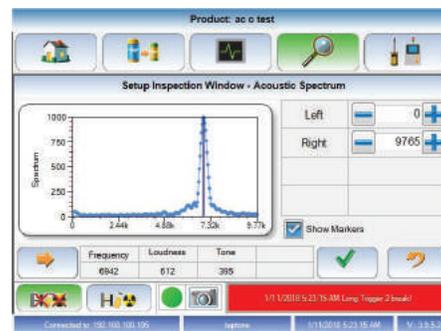
### TEST SUMMARY – BEER BOTTLES

The graphs (right) indicate that the loss of pressure, bent crown, and lower fill level were all easily detected by the TapTone T550 X-Ray, Acoustic, and Cocked Crown sensor. The combination of these systems is highly recommended for this application.

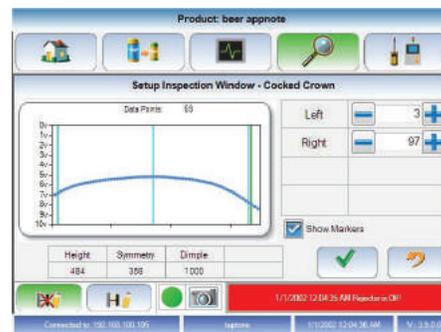


Frequency=7209  
Loudness=628  
Tone=507

“Good” Bottle on Acoustic Sensor

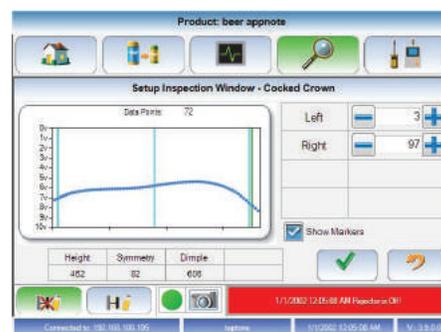


Frequency=6942  
Loudness=612  
Tone=395



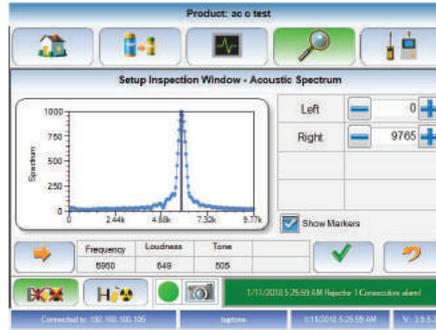
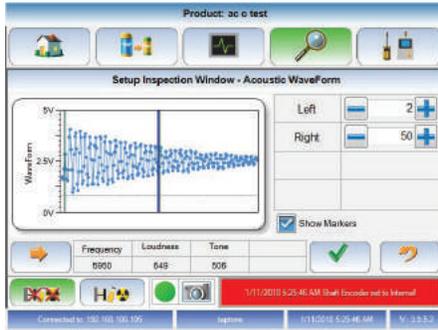
“Good” Bottle on Cocked Crown Sensor

Height=484  
Symmetry=358  
Dimple=1000



“Bad” Bottle on Cocked Crown Sensor

Height=462  
Symmetry=82  
Dimple=606



"Bad" Bottle  
on Acoustic Sensor

Frequency=5950  
Loudness=649  
Tone=506

## CONCLUSION

TapTone offers a wide variety of inspection sensors for production applications in the craft beer sector providing reliable inspection for both glass and can beer.

\* Merit value is a calculated number determined using an algorithm to compute a resultant from a set of data values. Test results achieved in the test laboratory may be different from results seen in the production environment.



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