



# Graphene

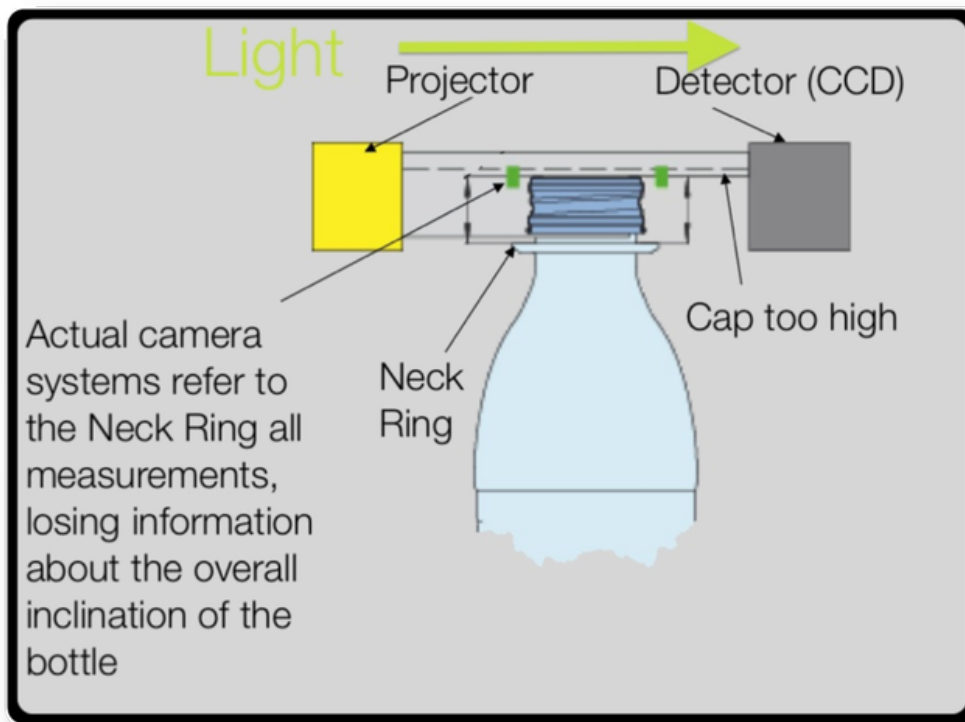
The Beverage Electronic Inspection Company



## Camera-based systems and slanted caps: when newer is not better

Slanted caps are today mainly detected by mean of CCD- or CMOS-camera equipped systems. Their reference point, the zero of all measured heights, is always the neck ring of the bottle, as visible in the image down. This technology, ideal to detect inclined or too-high caps over vertical bottles, fronts an intrinsic limit when trying to infer the inclination of caps lying over necks of bottles 'bent into tolerance'.

It can't reject slanted caps over the (frequently) inclined PET bottles, inclined because of irregularities of the bottle's base. Down an example: if the neck of the bottle is "bent into tolerance", CCD-camera system shall consider it a correct bottle (false negative).



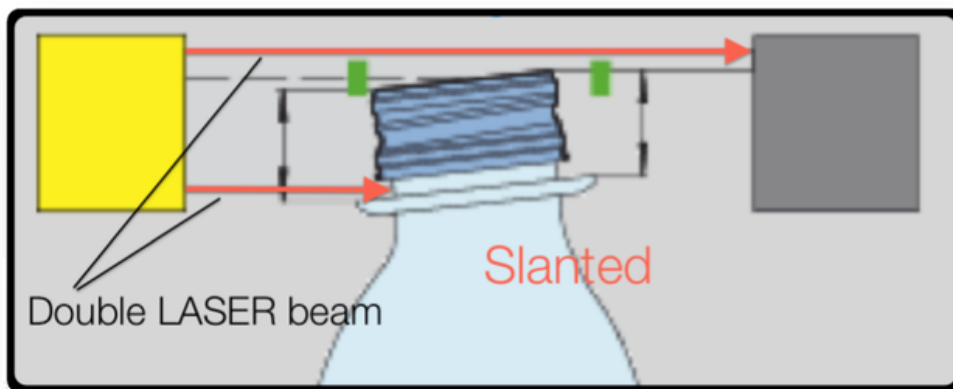
**Slanted cap inspection performed the way today standard, by mean of a camera system, fronts an intrinsic limit when trying to infer the inclination of caps lying over necks of bottles 'bent into tolerance'. It can't reject slanted caps over the (frequent) inclined PET bottles, inclined because of irregularities of the bottle's base.**

### The traditional LASER solution

Until around ten years ago it was standard another approach to the same problem: light was collimated to ~ 2 mm, by mean of a small lens in the LASER fiber-optic Detector.

Most important: the reference point was the conveyor holding bottles. Being referred to the conveyor, rather than to the neck ring, it was possible to detect also special defects otherwise, defects today unfortunately considered 'correctly closed bottles' by the CCD-camera systems costing twenty times more...

The same bottle, as seen by a Laser system based on the Conveyor, shall be correctly detected defective (true positive) and rejected. LASER beams' solution is today nearly unknown to Bottlers because Vendors invariably and actively propose the much more expensive based on cameras. It is, however, a permanent option into Vendors brochures.



**A cheap and simple to operate double barrier of LASER thin beams allows to detect and reject also slanted caps over bottles 'bent into tolerance' by random factors. PET bottles are particularly prone to this kind of events, due to their plastic nature.**

### Applying the LASER slanted cap inspection to a camera system

Caps 'bent into tolerance' are a percentage of all of the caps out of tolerance, in the range:

(5 - 10) %

We invite the reader to acquire with the due scientific skepticism the digits given him on Vendor's brochures, as 'Technical Guarantees' about Caps' rejects

They are too frequently based on unreal assumptions, different than the Operative Reality of the Bottling Line.

More, they feature a systematic tendency to fill of:

99.999..... %

what has to be expected. Keeping apart a row of Real Causes lowering those expectations, the Bottler shall later observe associated to False Rejects ratios compliant with the Technical Guarantees, only:

(90 - 95) %

of detection.

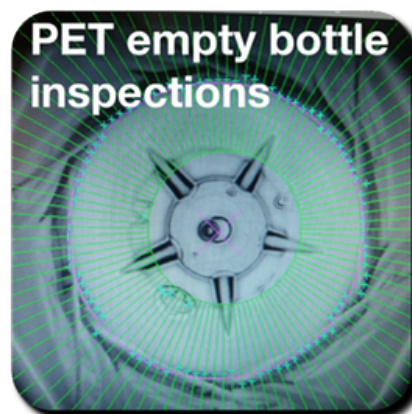
Questioned about why so remarked differences between Guarantees and Observed Reality, two different Commercial Managers by two different and competing Companies, independently used the same honest, lucid and coherent line of reasoning, and explained to the Writer of these notes that those digits are 'commercially-driven by the observation of what Competitors were promising'. Simply, it was not possible to promise less without to experience negative effects on sales.

To play the Food and Beverage Safety game the only thinkable way, the winning one, Bottlers have to consider all of the Scenarios. When desirous to reduce around

ten times the occurrences of slanted caps (a synonymous of: 'not closed bottles') say:

(5 - 10)% => (0.5 - 1)%

should have to firmly request this cheap option to the Vendor, closing this way an otherwise unavoidable gap into their defences.



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