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Defect Detection System For PET Preformer





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INTRODUCTION TO **PREFORM** TECHNOLOGY

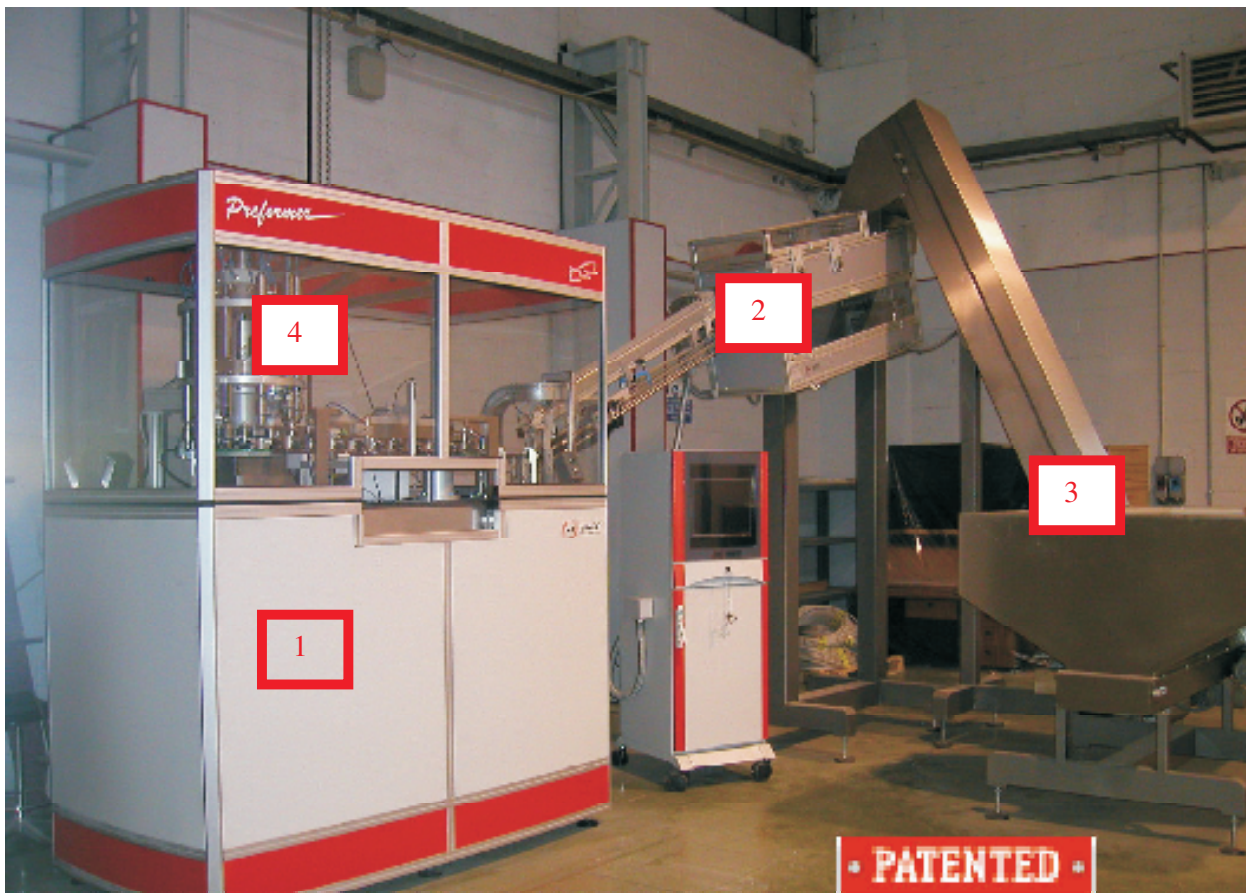
PREFORMER system has been designed with the aim to control the quality of the PET preforms by detecting their defects.

These typical defects may be originated by improper injection moulding, improper preform handling or off-spec/contaminated PET chips fed into the injection moulding machine.

The design of this system is the result of more than 20 years of operational experience in injection moulding of PET preforms for the world market.

Preformer sorts out with extreme precision + reliability the PET off-spec preforms by the computer vision (**5 CCD cameras**) and the vacuum technology (mechanical test)

Defects: oval shape, lack of material, lack of tightness of the sealing ring, incorrect geometrical dimensions, deformation, long injection point, micro-holes in the injection point, burnt rings, moisture rings, unmelts, crystalline (haze), foreign particles, black specs, bubbles, chromatic variations, streaks, etc.



Artificial Vision System - PET Preformer



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The Preformer advantages and limits

The complete system (PREFORMER) is able to sort and check the quality of 22,000 preforms per hour, whichever the type/dimensions and quality level of the preforms handled. All commercial sizes of preforms may be handled by Preformer System, ranging from 0.25-0.33 liters to 5 liters preforms including big-slam size, thanks to the specially designed gripping device which grants a high level of flexibility.

The systems scraps the defective preforms on one outlet gate and discharges the “passed” preforms to a second gate, allowing to stock both lots in a palletized standard box next to the control machine.

The main advantages to equip a preform production unit with an off-line quality system, are listed hereinafter:

- a. whenever the preform producer lately realize that his injection machine has been producing with inadequate parameters or feedstock for some time, he may use the offline quality system to check every preform in order to scrap only the defective ones, automatically recovering the whole lot
- b. whenever the preforms’ customer rejects a full consignment of preforms after experiencing quality problems on few of them, the producer may recover all the correct preforms out of the rejected lot, by using the off-line quality system and quickly return the client the recovered preform lot as a guaranteed on-spec delivery, without being obliged to restart the production of that type of preform.

It is important to underline that the System is not able to visually detect any defect in the “finish” area of the preform, i.e. the neck of the preform including the thread and the neck ring, apart from the performance of the previously described vacuum control which detects any geometrical defect or lack of material in the cap sealing edge. This limitation of the System is due the fact that the “finish” area interferes with the grips arms and therefore cannot be exposed to the cameras and the illumination system. Sort of “finish” visual control might be performed by installing a supplementary inspector assembly on a special design feeder ramp, where preforms are flowing to the quality cell with a coupled translation/rotation movement aimed to allow 360 degrees “finish” inspection.

Another limitation of the System is based on the preform colour intensity: certain difficulty has been experienced in sorting strongly coloured preforms (used for oil bottles, like yellow, red and dark brown ones) bearing light defects: a certain level of transparency is a must for obtaining a perfect image acquisition of the preform and for detecting even its lightest defects.



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COMPOSITION OF PREFORMER

I off Quality Control System for PET preforms, PREFORMER™, version 2007, as composed as follows (with reference to photo):

UNIT 1)

Quality control cell/Inspection module, including:

3-camera visual check for sidewall surface, able to detect defects exceeding or equal 0,2-0,5 mm within 150 mm range;

Seal surface/bottom inspection camera assembly (2 cameras), able to detect same size of defects on seal ring and bottom of preforms, equipped with strobo light device/feeder;

New updated software version with enhanced sensitivity on colour variations;

Precision chain-driven handling system to position preforms for accurate inspection, with fixtures for one finish/body size only (note: customer must specify size and dwg. of preforms), 30 quick-change grips assemblies for fast job change operation; HW+SW computer system with console, electrical cabinet and cabling, able to control up to 22,000 preforms per hour

UNIT 2)

Preform Feeding System including:

Preform Unscrambler, consisting of two inverter driven-variable speed counter-rotating rolls; a vane wheel at each end for re-directing non-oriented preforms; equipped with hand-wheel adjustment of distance between the rolls axis to accommodate different preform sizes;

Preform gravity feeding section (feed ramp), equipped with two preform guides with handwheel adjustment for different preform sizes; photocells to ensure automatic ramp filling and machine stop in case of lack of preforms in the ramp, rated capacity 22,000 preforms per hour

UNIT 3)

Preform Loading Bin and Elevator, including Belt Elevator built in stainless steel with internal plastic lining, designed to be oriented in -90°/0°/90° positions, stand and connections; Preform Loading Bin, built in stainless steel with internal plastic lining, equipped with a horizontal belt conveyor to continuously feed the elevator without interruption or congestion

OPTIONS & ACCESSORIES

UNIT 4)

Vacuum-test/multiple head system, mechanically testing each perform under vacuum with spherical probes, able to detect leaks and pin holes, to be fitted to the basic

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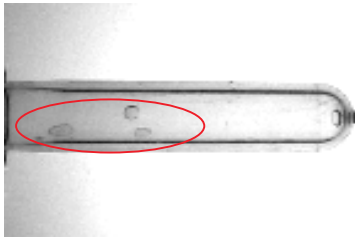
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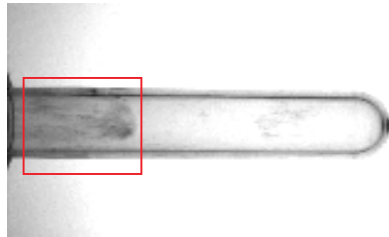
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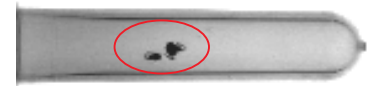
TYPICAL DEFECTS ON LATERAL SURFACE



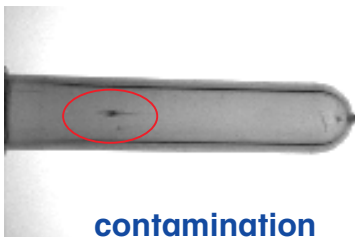
bubbles



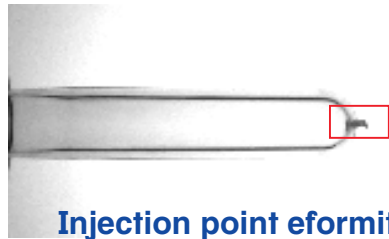
humidity trace



inclusions



contamination



Injection point eformity

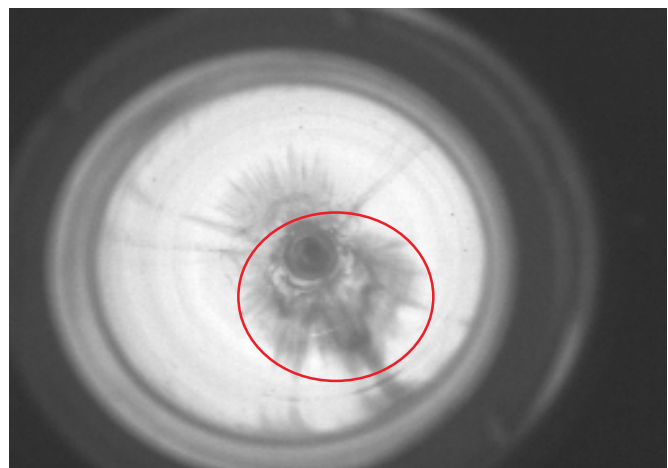


streaks

Examples of TYPICAL DEFECTS ON TOP / BOTTOM SURFACE



**TOP
material lack**



**BOTTOM
humidity trace**