

Technical News Bulletin

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FLEXRadar Forming Process Monitor System



Introduction

FlexRadar is a glass forming process monitor system that produces thermal images of the glass containers as they are transported from the forming machine. The system utilizes high-resolution infrared technology to measure the level of intensity that is radiated from the hot glass containers. The thermal images are a direct representation of the glass distribution within the container allowing for identification of glass forming process deviations and quality issues. They also provide for detection and rejection of critical defects in the hot end.

Using two high-resolution infrared cameras positioned at an angle on opposite sides of the conveyor, FlexRadar captures thermal images from each passing container. Those thermal images are processed to identify cavities producing containers with glass distribution or dimensions that stand out from the overall population. Cavities or sections producing outliers are quickly identified and reported to the hot end operator for immediate corrective action.

In addition to trend analysis and the identification of outlier containers, the FlexRadar has good capabilities to detect and reject Thin bottom, Wedged bottom, Thin neck, Chocked bore, Fin, Thin spots, Bird swing, Freak, Verticality, Stuckware and Inclusions. Finding these defects already on the forming side of the Lehr is a key element for rapid actions to maintain stability in the forming process.

System Description

FlexRadar comes with two infrared 1024-pixel line scan cameras that are water cooled. These are installed at an angle on opposite side of the conveyor. A **User Console** is supplied with the system for installation in the machine area. The system also comes supplied with one **terminal** that can be placed in the operator's room. Additional operator interfaces/terminals are available as options as the system can host up to three connections to the user interface simultaneously.

FlexRadar comes standard with two **Camera Units**, one **Control Cabinet**, one **Operator Console**, one **Terminal**, one **Database Server** and one **Cooling Module**.

FlexRadar supports Ethernet connection to your factory information system for remote monitoring, real-time data gathering, data archive, and integration in production reports.

Bottle spacing closed loop

FlexRadar is integrated with Bucher Emhart Glass FlexIS Forming Line Control system. Based on the container position on the flight conveyor from FlexRadar, FlexIS automatically adjusts the timing of the push-out to maintain proper container spacing, preventing interference on the conveyor and jams at the ware transfer. See TNB 220 (Bottle spacing control).

Hardware

Camera unit – Water cooled infrared imager. They acquire thermal images of each passing container and operate on 24V DC with Ethernet connections supplied by the Control Cabinet. Maximum cable length to Control Unit is **50 meters**. The camera unit is adjustable in height and has an interchangeable lens to cover all variations of container heights on a forming line. The Camera Unit has a robust protective screen and easy to exchange glass windows.



Control Cabinet - contains the computers and controls and comes either equipped with an air conditioning unit for the factory floor installation or a top ventilator for installation in a control room. It supplies power and signals needed for the camera units and the Operator Interface. One Control Cabinet can host two FlexRadar systems taking into account that the maximum distance of **45 meters** between the Camera Unit and Cabinet is not exceeded.



User Console – Acts as the main human machine interface for the operators. Floor standing version can be mounted in a variety of ways to suit the surrounding. A Terminal version is always supplied with the system for installation in the control room. Maximum cable length to Control Cabinet is **50 meters**.



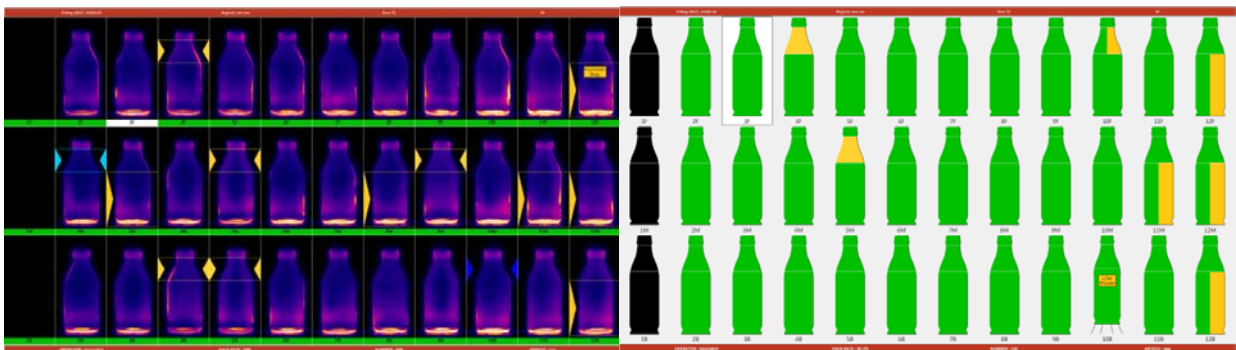
Data server – 19" server computer that houses a database and a web server. The Data Server is connected to the customers LAN and installed in the server room in the glass plant. There is one data server for each plant that has a Blank or FlexRadar.

Cooling module – The two camera units of the FlexRadar are water cooled and the system is supplied with a dedicated cooling module that ensures that the IR-cameras remain in a stable and controlled temperature range during operation.



User Interface Screens

Overview Screen – Provides the user with key information during running production like warnings, alarms and rejections from each cavity. The overview screen can be toggled between a “live” version that displays the last captured image from each section and a graphical version.

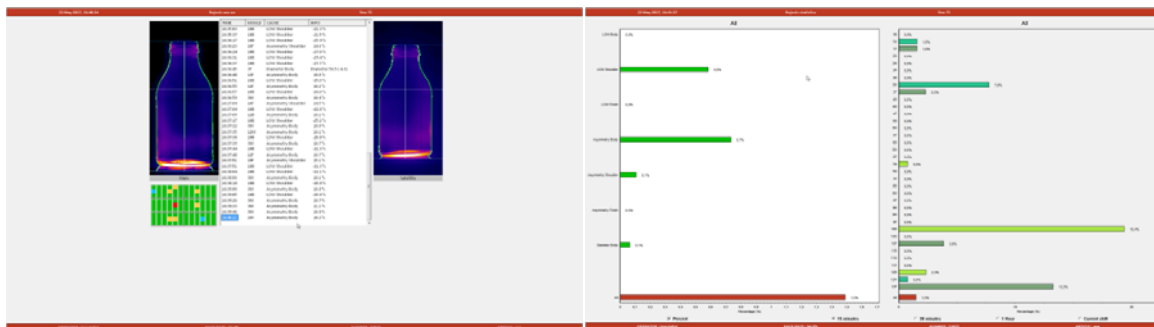


Last rejects and reject statistics – Using the reject information that the FlexRadar provides the user can identify problematic sections and cavities on the forming machine.

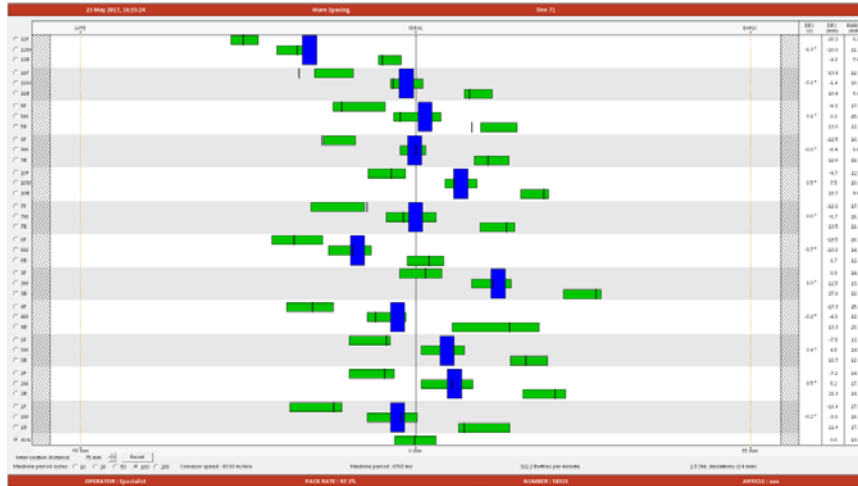
Information that is provided from the last reject screen is:

- Time
- Cavity and section
- Cause of rejection
- Measured quantity

From the reject statistics it is possible to see an overview of the magnitude of the rejections from the forming machine as well as the cause of the rejection.



Transport – The transport provides information about how the actual ware spacing and ware positioning relates to the ideal positions on the conveyor belt.



Application

FlexRadar can be installed on any glass container production line with single flight conveyor to monitor, analyze, and improve production. It supports the complete color range including non-round and unusual shapes and supports multi article production (Multi Gob) as well as tandem IS machines.

Installation Requirements

Control cabinet

Electrical Power: 230VAC 50/60 HZ, 3 kW
Temperature: 0-40° C

Server

Electrical Power: 110-230 VAC 50/60 HZ, 1.4 kW
Temperature: 10-35° C
Humidity: 5-95%

Terminal

Electrical Power: 12 VDC, 45 W
Temperature: 10-35° C
Humidity: 10-90%

Operator station

Electrical Power: 230 VAC 50/60 HZ, 420 W (Air conditioner)
Temperature: 10-50° C
Protection grade: IP 54

Camera unit

Temperature: 0-100° C
Protection grade: IP 54

Cooling module

Electrical Power: 400/460 VAAC, 50/60Hz, 2.9 kW
Temperature: 0-100° C
Protection grade: IP 54

Summary

- Capture thermal images of glass containers on the flight conveyor after the IS machine
- Thermal images are a direct representation of the glass distribution within the containers
- Identify outliers in production. Report to operator for corrective action.
- Reject dimensional and critical defects in the hot-end
- Prevents jams at the ware transfer. Protects cold end equipment
- Synchronized with IS machine to identify sections/cavities
- Integrated with Bucher Emhart Glass FlexIS Forming Line Control system
- Supplied with one user console for the machine area and one terminal for the operators room
- Closed loop water cooling system
- Operates on any glass container production line with single flight conveyor
- Support round, non-round and unusual-shape containers
- Support the complete product color range
- Support multiple article production
- Support tandem IS machines
- Ethernet communication with factory information system

Features / Benefits

Features	Benefits
Live thermal images of containers	Every cavity on one screen Hot-end operator can quickly identify cavities producing outlier containers. <i>“Live” quality feedback = increased efficiency</i>
Closed-loop with FlexIS Control System	Reduces the demand on the hot-end operator. Reduces requirement for forming process specialist. <i>Less demand on operator = increased efficiency</i>
Flexible installation configurations	Supports multiple products on same production line as well as tandem IS machines. <i>Supports Multi Gob + tandem = flexibility</i>
Container geometry verification and defect detection	Identifies lean, diameter, freaks, choke neck, down ware, and stuck ware. Identifies stone, blister, birdswing, mold -fin, thin-neck, thin-wall. <i>Prevents jams at the ware transfer and protects the cold end equipment = increased efficiency</i>
Internet remote access	Plant management and production specialists can remotely supervise production to provide technical support and assistance. <i>Remote support = increased efficiency</i>
Process automation	A key component to facilitate End to End technology!