

Technical News Bulletin

Cham, March 2018



Introduction

BlankRadar is a gob loading and temperature measurement system that is installed in the blank panel of the forming machine. The system consists of a camera housing that is transported along the length of the forming machine by a servo electric motor. BlankRadar stops in front of each section and takes a user definable number of consecutive measurements. The camera housing is water cooled and hosts the required electronics and sensors for the temperature measurements as well as the gob loading measurements.

The **gob vision module** of the BlankRadar takes automatic real time measurements of the falling gob right before it enters the blank mold. It captures the key physical entities of the gob as it loads:

- Diameter
- Length
- Velocity
- Time of Arrival
- Position

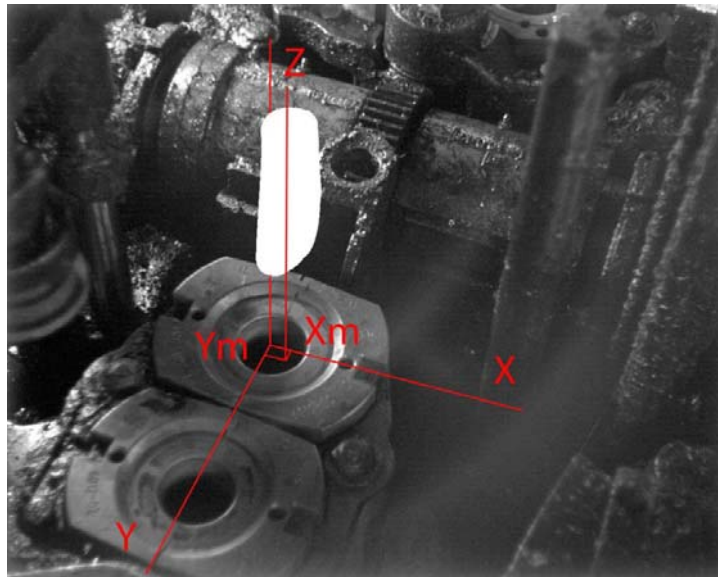
The measurements are taken using two high speed cameras that capture 500 frames per second. The data from the cameras is then processed and displayed to the User. With the information provided by the system the user can be prompted to take action prior to the creation of a defect or section jam.

BlankRadar is equipped with a **temperature module** that facilitates automatic measurements and can measure:

- Blanks
- Neckrings
- Plungers
- Parisons

Due to the rapid positioning system several measurement locations can be selected and captured within the same section cycle. The user can set limits and define alarm levels using the data that is sampled from the temperature measurements as well as the gob loading monitor.

BlankRadar gives the users the opportunity to find optimal gob loading and maintain this over time. Therefore improving the process stability and avoiding defects related to incorrect gob loading. The data from the temperature signals can be used as input signals to the Blank Cooling Control (See TNB 220) and the Plunger Cooling Control(See TNB 249).



System Description

BlankRadar has a robust design to ensure reliability its harsh area of operation. The high speed cameras that are mounted inside the camera unit are protected from pollution with protective glass. The unit also has an automatic shutter system that minimizes potential pollution of the protective glass as the shutters are closed when a section is swabbed on the forming machine. The electronics and sensors are protected against the



heat from the glass production by a closed loop water cooling system.

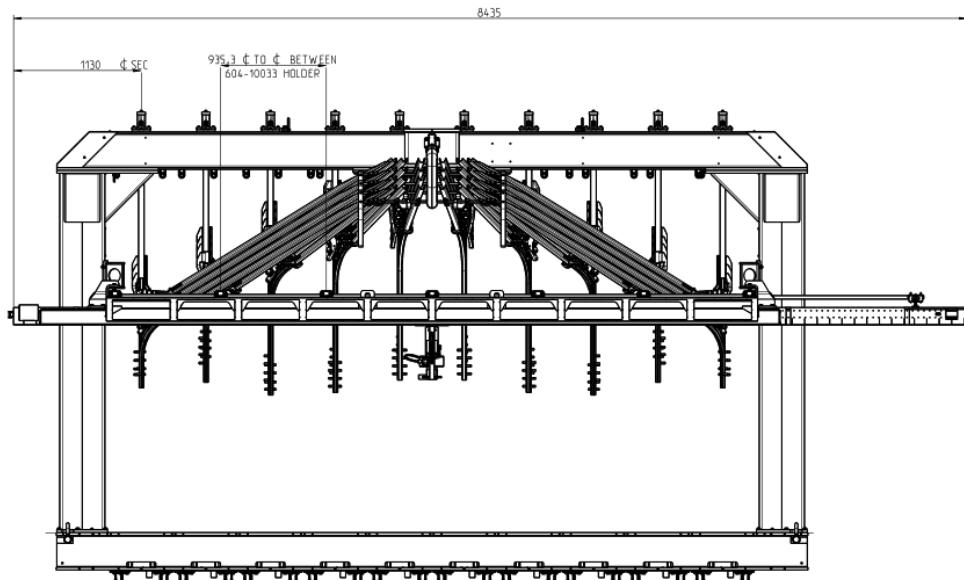
BlankRadar standard delivery consists of:

- Linear Rail
- Camera Unit
- User Console
- Terminal
- Control Cabinet
- Data Server
- Cooling Module

Additional Operator Interfaces are available on option as the system can host up to three connections simultaneously. BlankRadar has a scalable and expandable system architecture based on Ethernet and allows for easy retrieval of process information from the data server.

Hardware

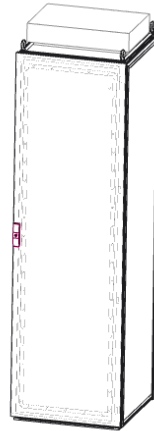
Linear rail – Facilitates the movement of the Camera Unit across the length of the forming machine. The Linear Rail is available with a maintenance position which extends the rail by 1 m on the Lehr side of the forming machine. This allows that preventative maintenance and standard operating procedures can be performed on the Camera Unit without exposing the user to heat from the section or potential hazards.



Camera Unit – Hosts the sensors and electronics of the system and comes equipped with an automatic shutter system that reduces pollution of the protective glass. The unit has a mirror based high speed positioning system for the sampling of the pyrometers. The slim design of the camera unit enables that the normal work routines can be performed on the machine without interference with the operator.



Control Cabinet - contains the computers and controls. Available in two versions, one for control room installation and one that is equipped with an air conditioning unit for factory floor installation.



User Console – contains a screen, keyboard and roller ball. The User Console is aimed to be installed in the vicinity of the forming machine and has for this reason a robust design. For control room installation a terminal is always supplied with the system which can be connected directly to the customers LAN. Maximum cable length to Control Unit is **50 meters** between User Console and Control Cabinet.



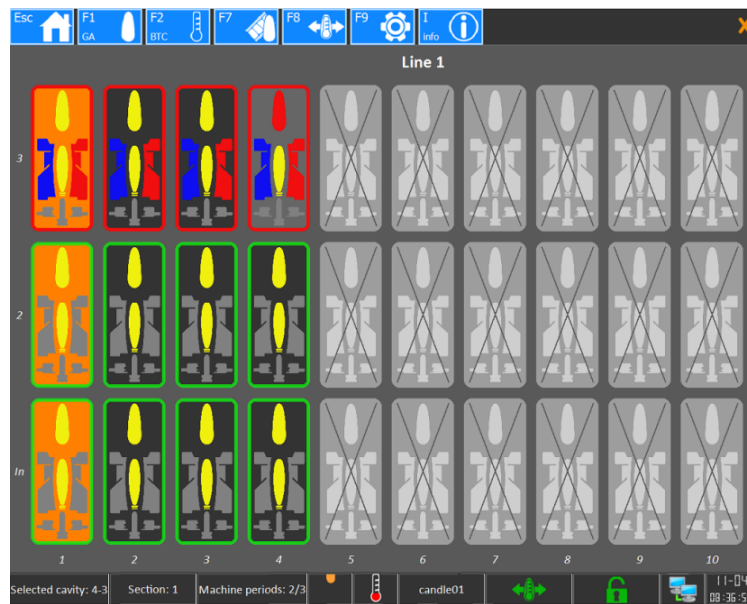
Data server – 19” server computer that houses a database and a web server. The Data Server is connected to the customers LAN and installed in the server room in the glass plant. There is one data server for each plant that has a Blank or FlexRadar.

Cooling module – Water based closed loop cooling system. The cooling module receives temperature feedback from the Camera Units to ensure a stable and consistent cooling effect on the measurement equipment. Failures or a violation of the limits of the cooling equipment notifies the User to take action.

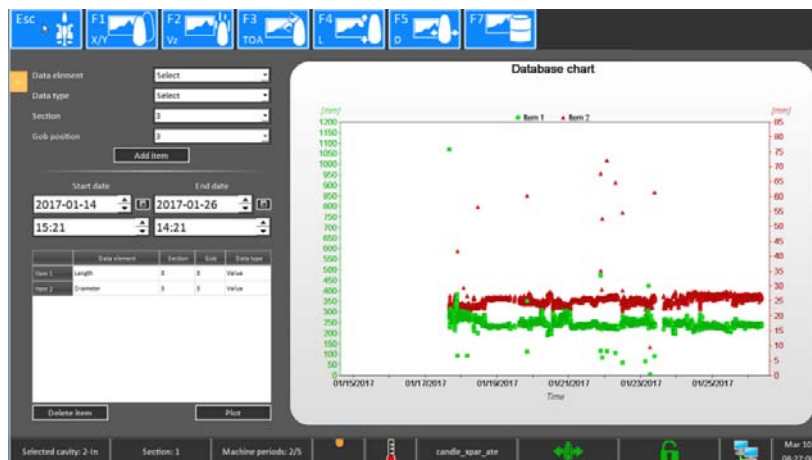


User Interface Screens

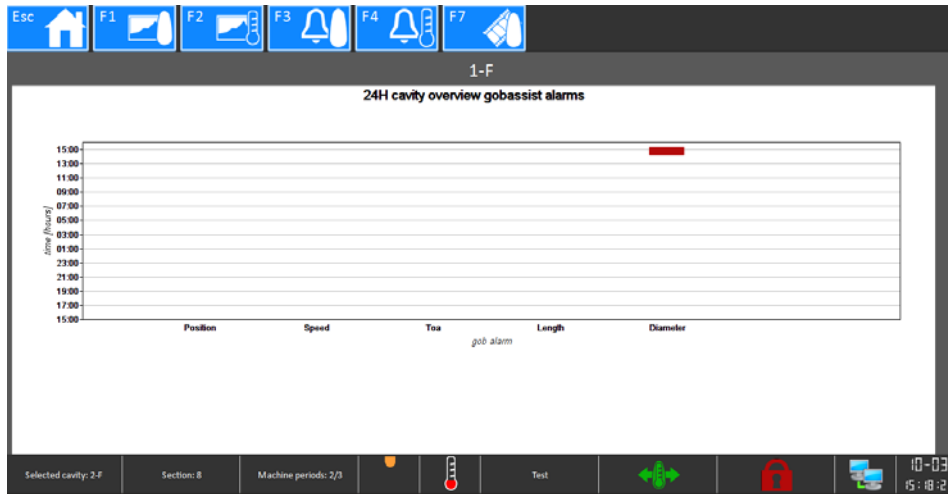
Overview Screen – Displays violations of alarms limits that have been set by the user. This enables that the User can take corrective action to changes in the loading pattern or temperature before defects are created or a section jam up.



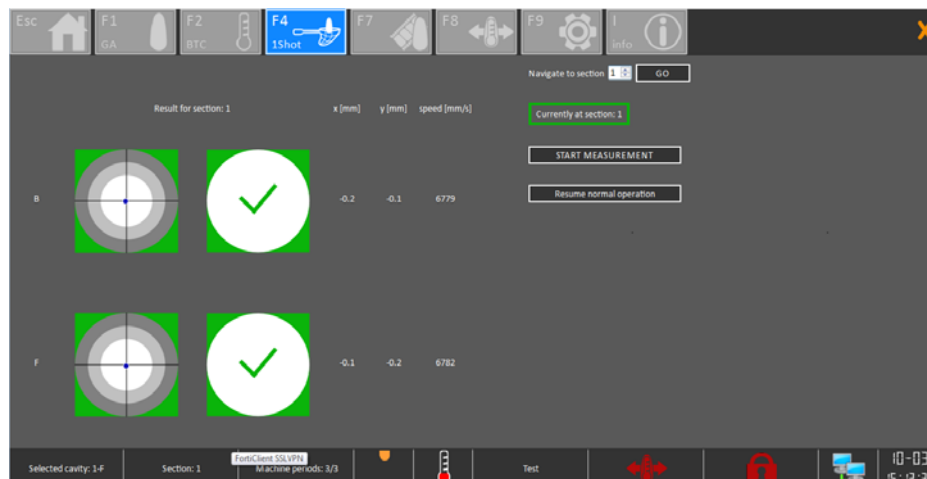
History Screen – Review of the past measurements can be done using pre-defined filters. It is also possible to make queries and review data further back in history.



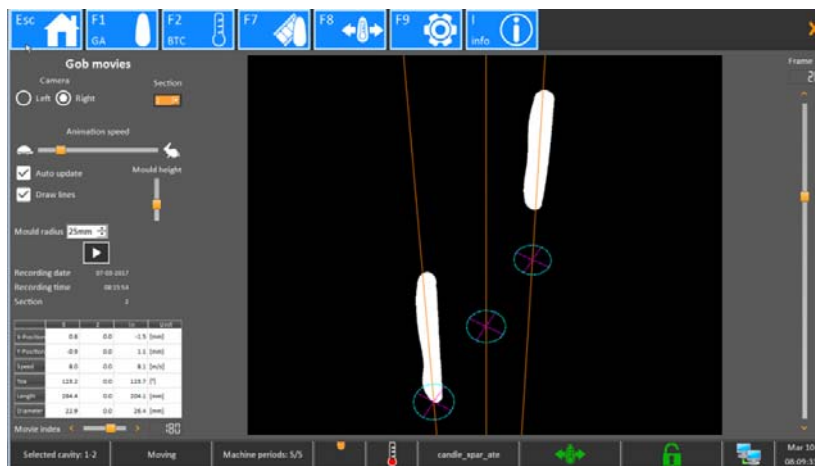
Alarm history – Gives the User a quick overview regarding which limits have been violated during the last 24 hours. The system can be configured to save pictures of the gobs when an alarm is triggered for review.



One shot – Function that gives the user a quick reference to where the gobs are loading into the blank when starting up a new job.



Temperature measurement setup – After installation and calibration each individual cavity on the forming machine will have its own defined coordinate system. By adding some key dimensions of the mold equipment on the running job, the system can calculate the required measurement locations across the complete forming machine by the click of a button. The measurement locations can be reviewed and adjusted using a vision based confirmation screen that can be viewed from any of the user interfaces.



Real time job loading movies – The system records movies of the loading gobs that can be reviewed for visual analysis of the loading.



Application/Availability

BlankRadar is available for the following forming machines.

Type	Name	Gobs	Center	6	8	10	12
NIS	NIS	4	95 mm	-	●	X	X
		3	5"	-	●	X	X
		2	6.25"	-	●	X	X
BIS	BIS	3	95 mm	-	□	□	□
		2	140 mm	-	□	□	□
AIS	AIS	3	4.25"	-	X	X	X
		2	6.25"	-	X	X	X
IS	4.25"	3	3"	-	●	●	●
		2	4.25"	-	●	●	●
		1		-	●	●	●
	5"	4	64 mm	-	●	●	●
		3	85 mm	-	●	●	●
		2	5"	-	●	●	●
		1		-	●	●	●
	5.5"	2	5.5"	-	●	●	●
		1		-	●	●	●
	6.25"	3	4.25"	-	●	●	●
		2	6.25"	-	●	●	●
		1		-	●	●	●

X	Available
□	Planned
●	On demand
-	Not available

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

Cooling module

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

Summary

- Measures key physical quantities of the falling gob
- Automatic temperature measurements on mold equipment as well as glass parison
- High speed sensor positioning system
- Long term trending of gob and temperature data
- User alarm prevents jammed section and shifts in glass distribution
- Synchronized with Bucher Emhart Glass FlexIS Forming Line Control system
- Provides input signals for the Blank Cooling Control and the Plunger Cooling Control
- Closed loop water cooling control
- Robust design to ensure operation in the harsh glass production area
- Scalable system architecture
- Operator Interfaces on the factory floor and/or in the control room
- Ambient temperature up to 70° C
- Data server for long term data storage and queries
- Intuitive user interface
- Viewable movies intended for manual analysis of gob loading

Features / Benefits

Features	Benefits
Operator attention screen	<p>Displays alarms for the user that prompts preventative action before a section jam up Less downtime = increased efficiency</p>
Closed-loop with FlexIS Forming Line Control system	<p>Reduces the demand on the hot-end operator. Reduces requirement for forming process specialist. Less demand on operator = increased efficiency</p>
Gob monitoring	<p>Provides the user with a tool to reduce defects related to inconsistent/incorrect gob loading Less downtime = increased efficiency</p>
Temperature measurements	<p>Provides the operators with high quality data taken with precision in position and time. Reliable data = Better process information</p>
Internet remote access	<p>Plant management and production specialists can remotely supervise production to provide technical support and assistance. Remote support = increased efficiency</p>
Process automation	<p>A key component to facilitate End to End technology!</p>