
G M W

3-Dimensional Image Processing for Gob Measurement & Weight Control

Glass Forming Technology Team

Mitsuo Ueda

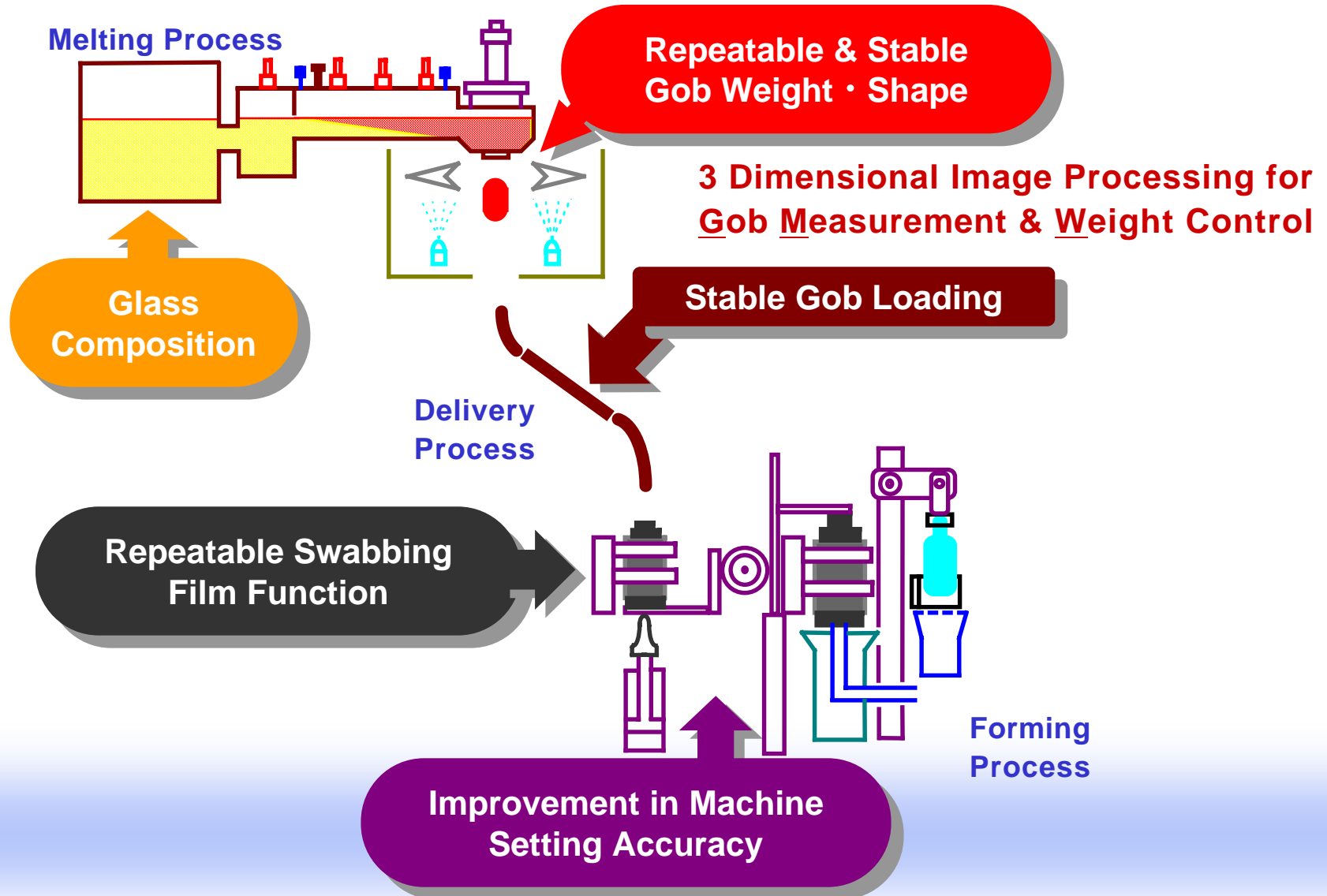
(presented by Melvin Si, Glass Forming Technology Team)

September 21, 2006

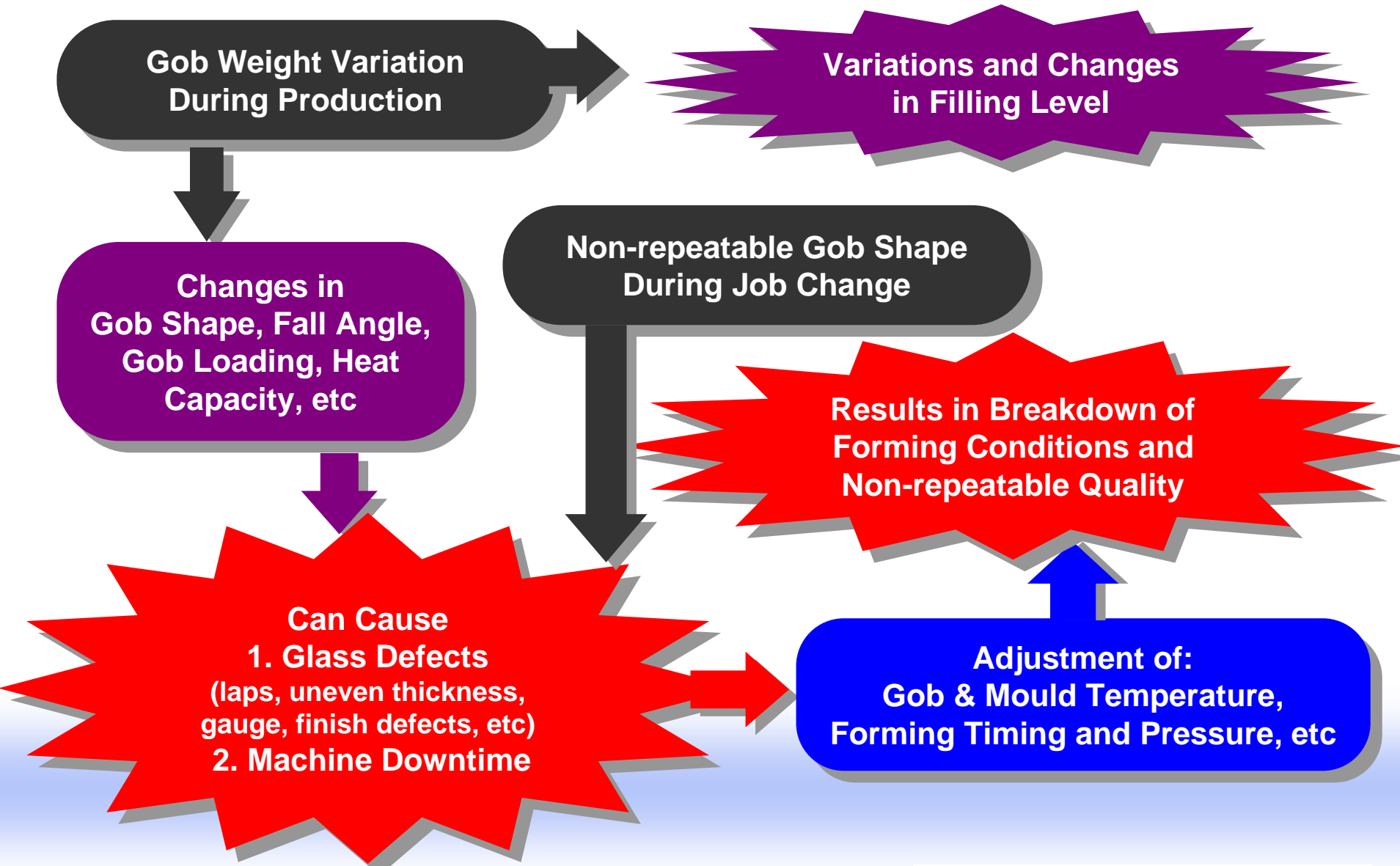


Development Concept

High Quality Bottle Production



Importance of Gob Weight & Shape

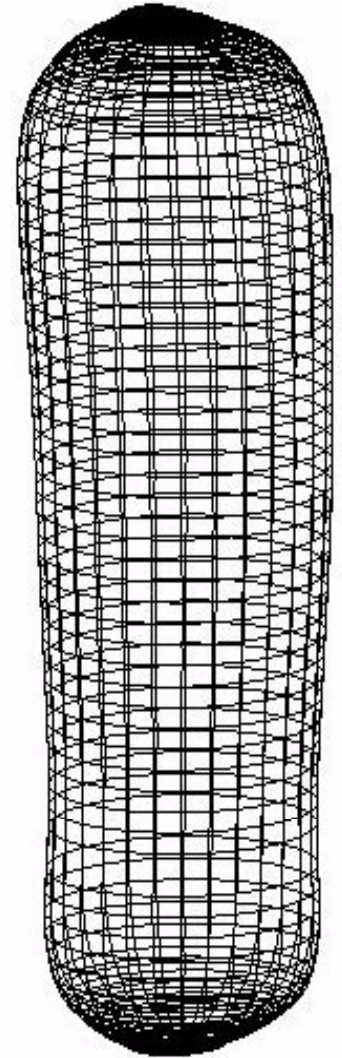
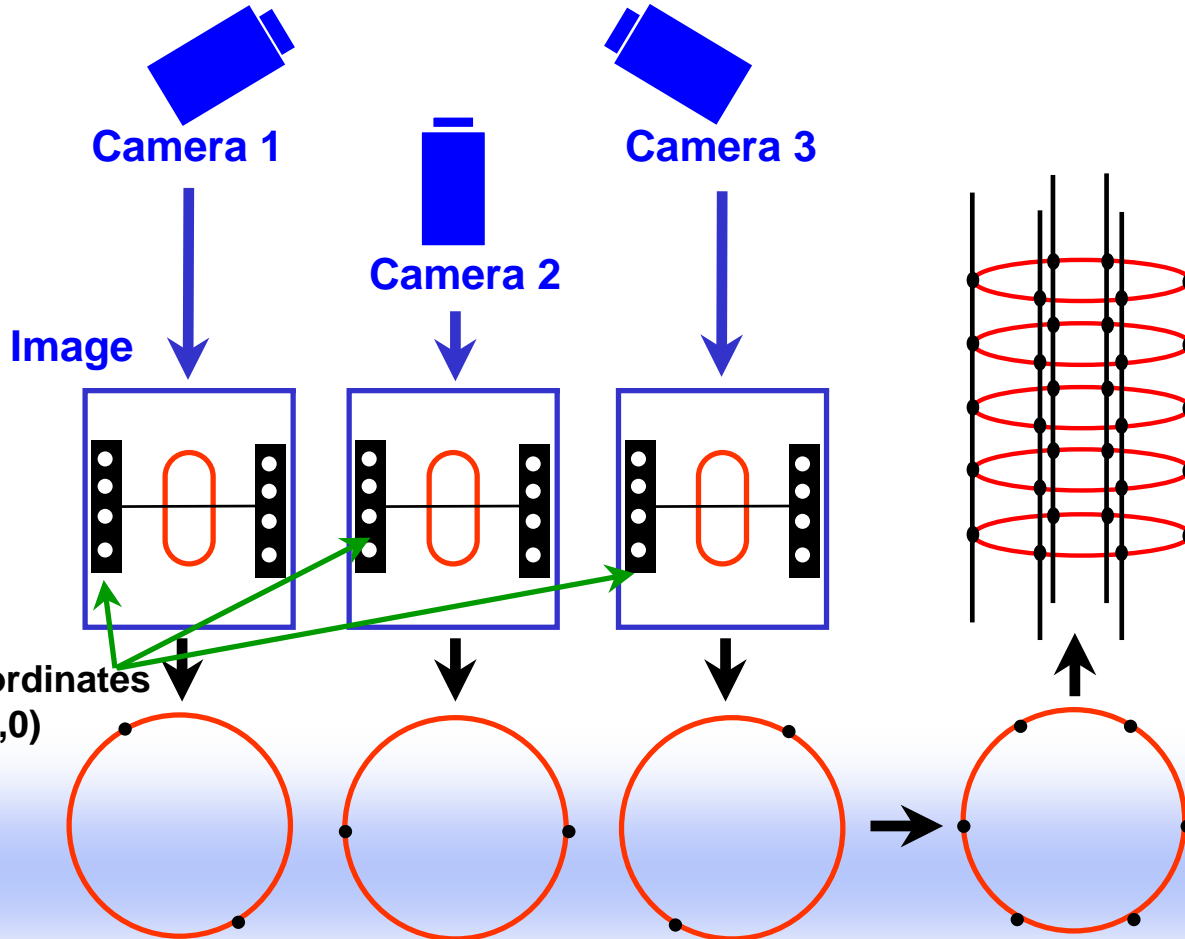


Gob Measurement Principle

3 Dimensional Measurement Principle

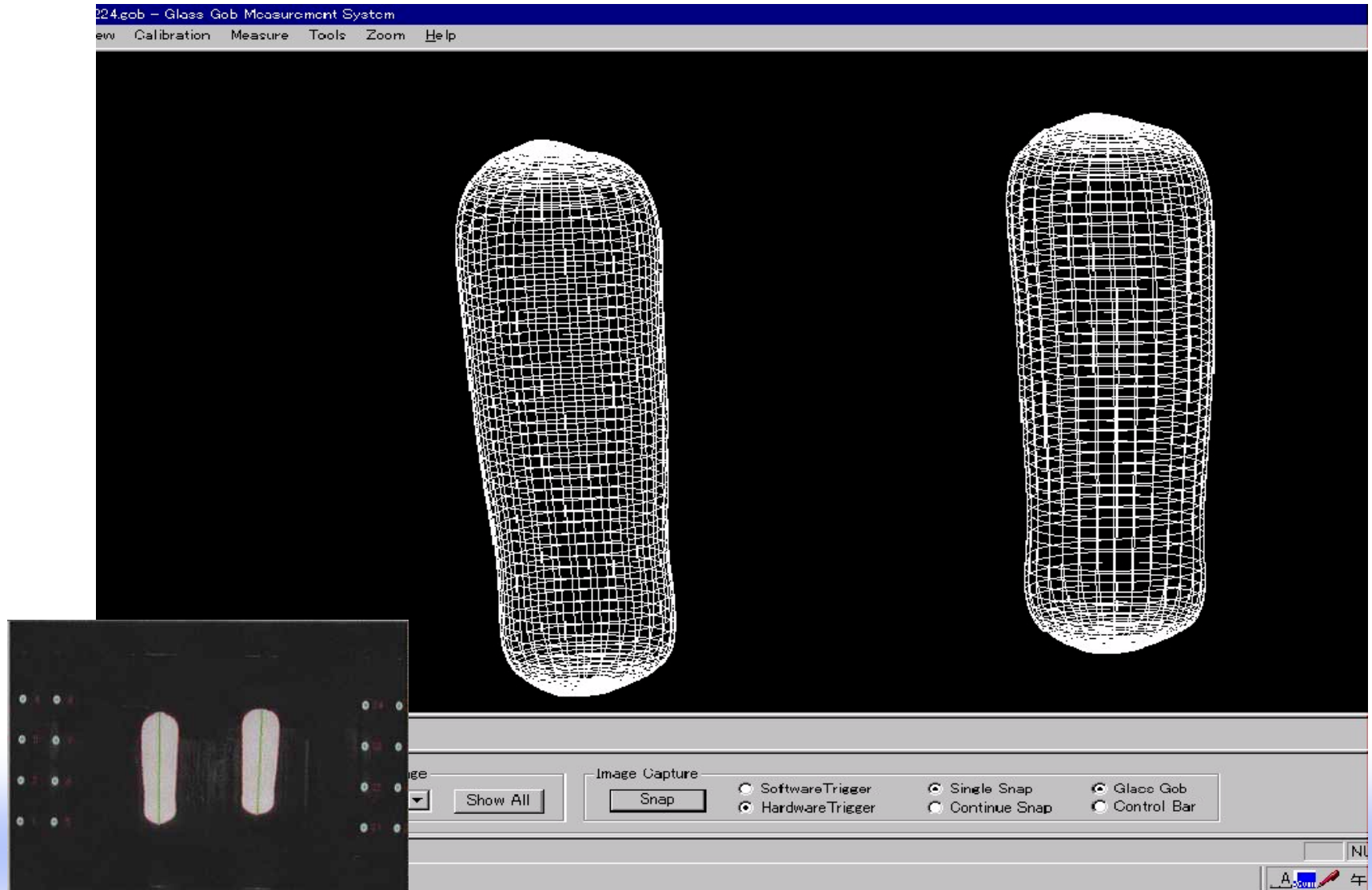
Calibration Post

Gob

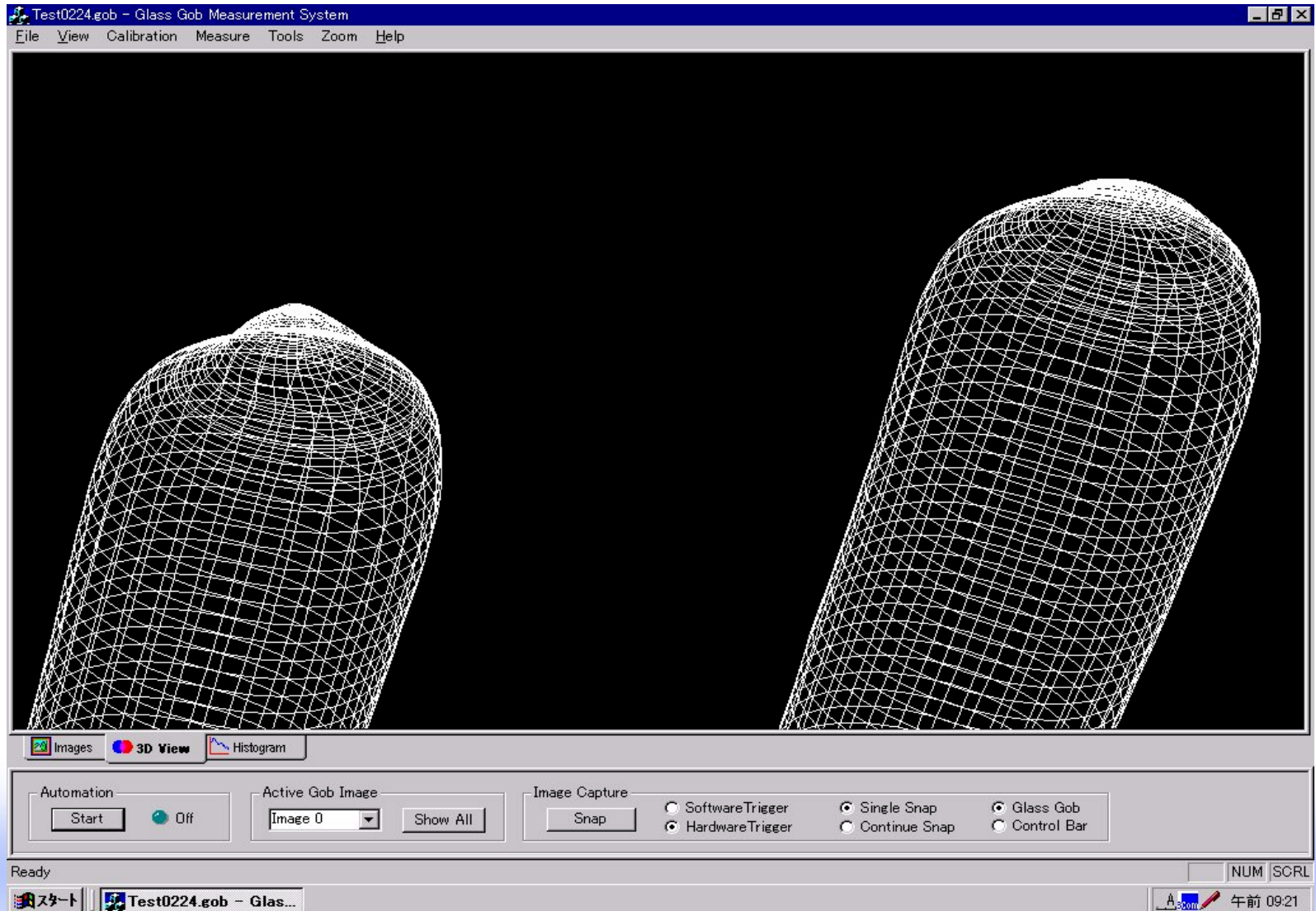


Wire Frame Image

3 Dimensional Gob Wire Frame Image

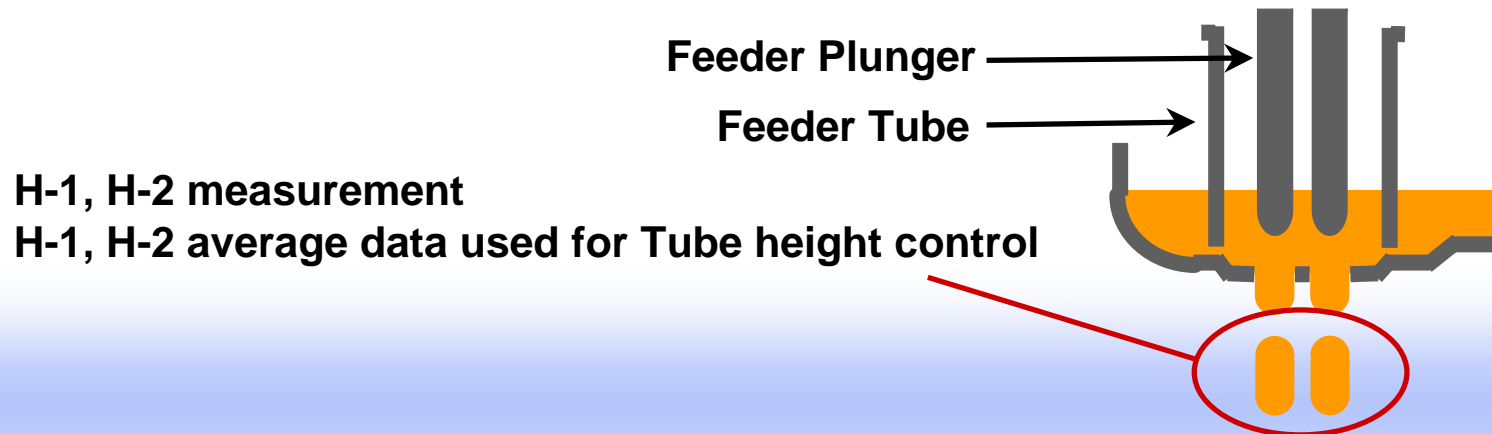


3 Dimensional Gob Wire Frame Image (Zoom)



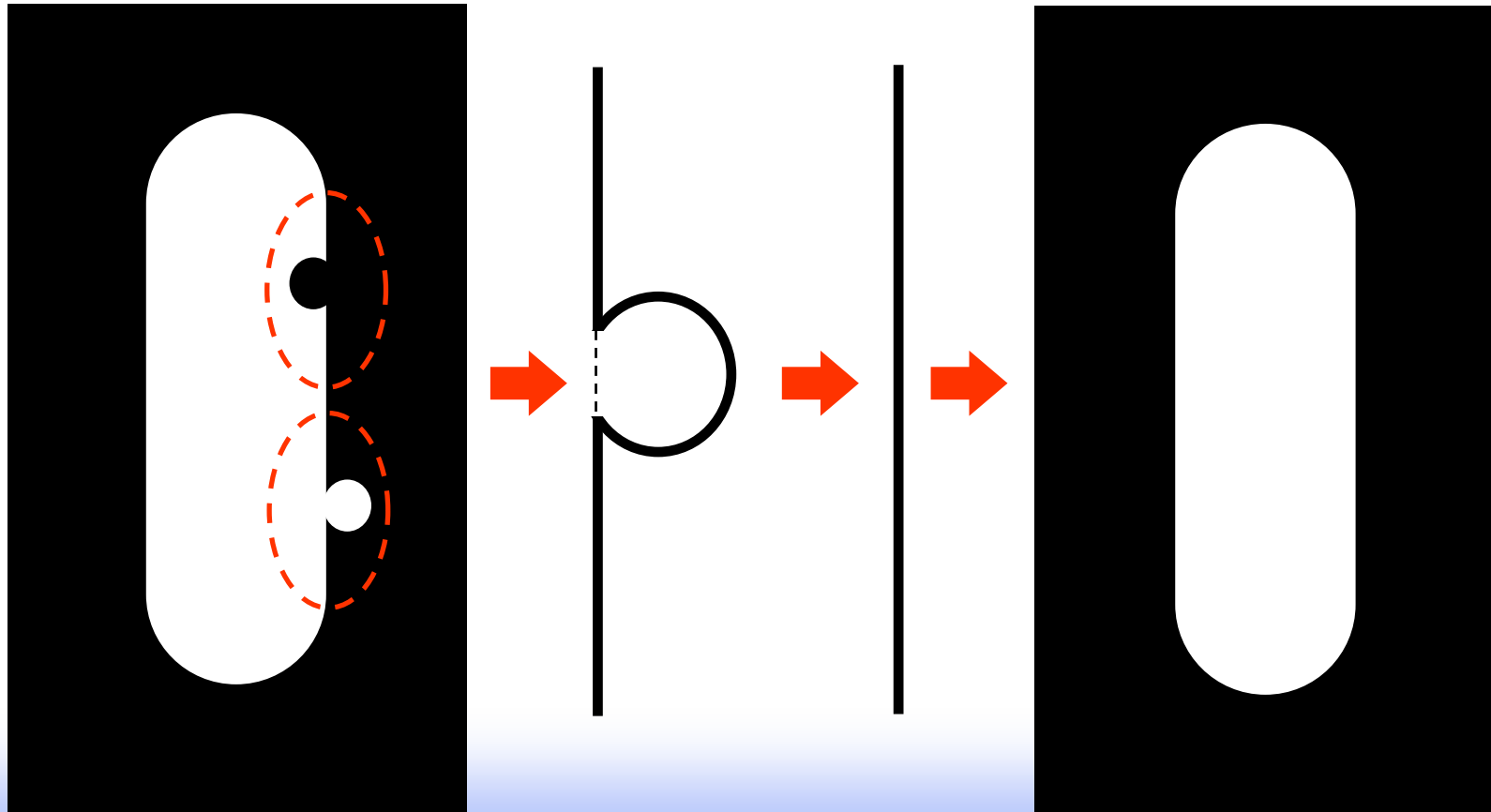
Numerical Representation of Gob

1. Continuous volume calculation from gob image
2. Automatic volume(calculated) control
= Automatic Weight control
3. Measurement of each cavity. Average value use for control logic.
Feeder tube height control.
4. From the 3 dimensional coordinates:
Gob length, fall angle, drop consistency are numerically calculated.



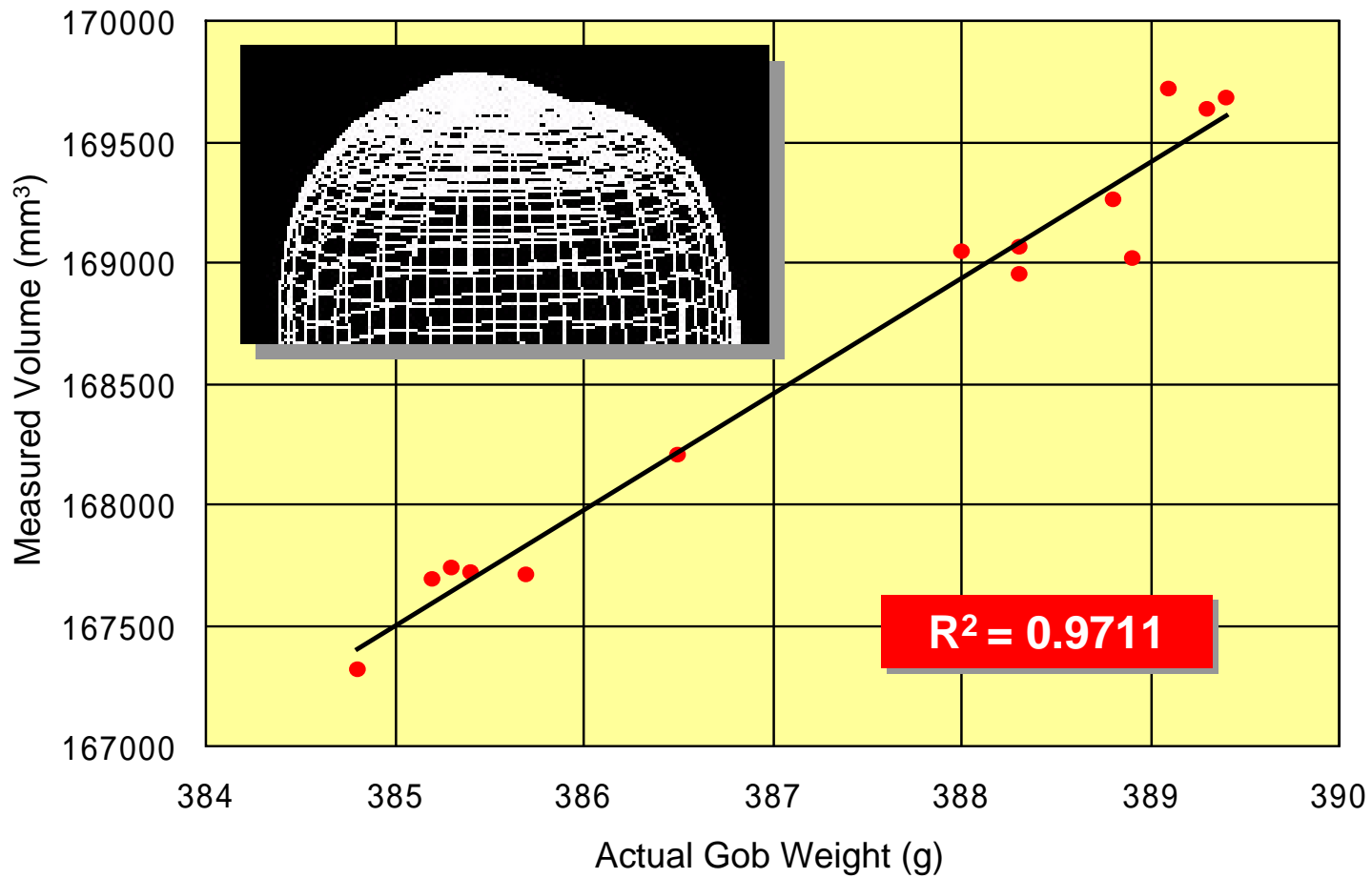
Volume Measurement Accuracy

Image Processing of Water, Oil, Shear Spray Particles on Gob Edge



Volume Measurement Accuracy

Relationship between Measured Volume and Actual Gob Weight



System Structure

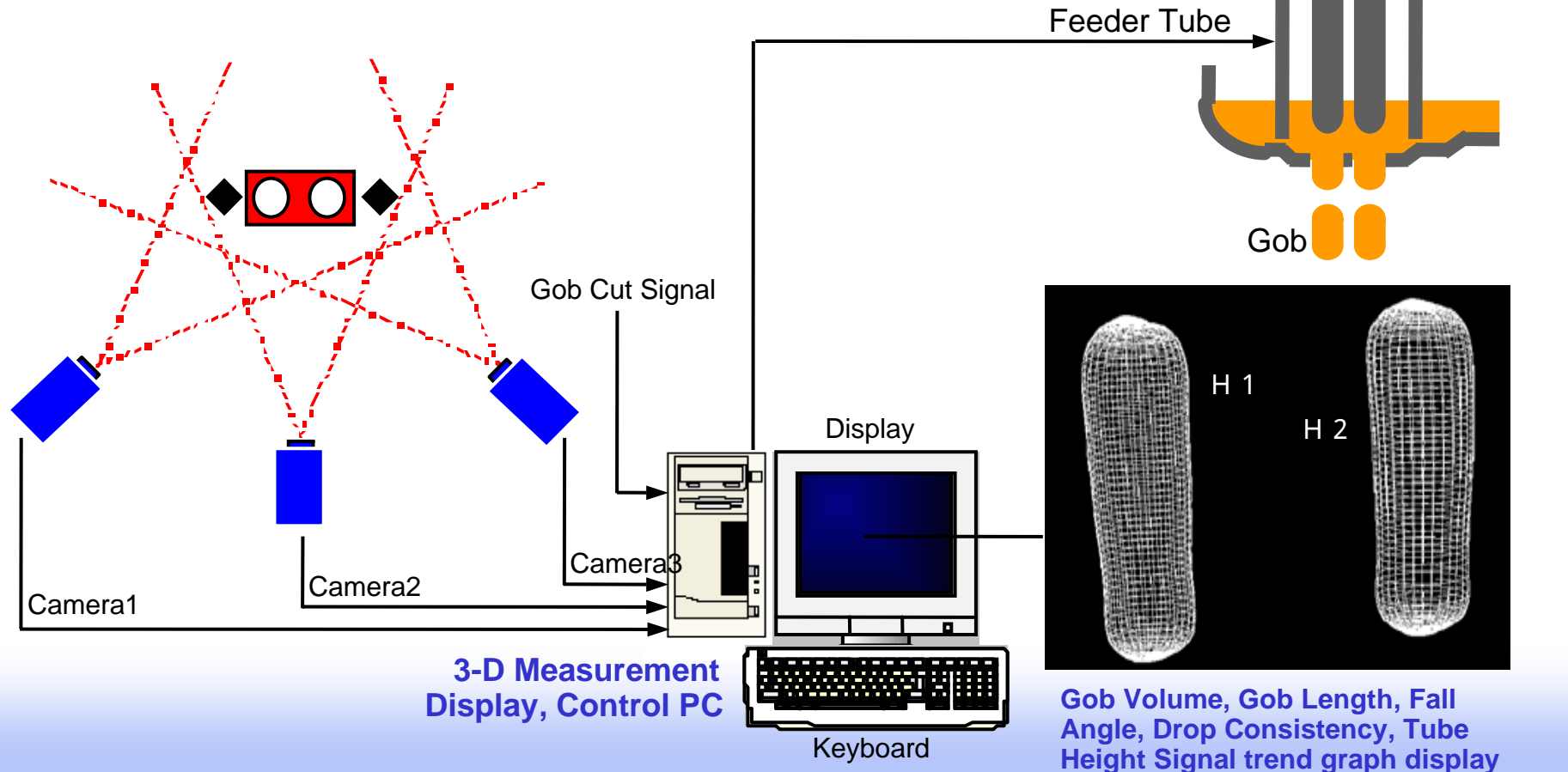
GMW System

Patent Pending

Processing Speed: 1.5 sec/gob

(Trigger Signal - Measurement - Calculation - Output - Signal Standby)

Automatic Control for all process: BB, PB, NNPB



Camera: Water Jacket, Lens: Air Purge System

Gob Volume, Gob Length, Fall Angle, Drop Consistency, Tube Height Signal trend graph display

System Features & Performance

GMW Features & Performance

Automatic Gob Weight Control

- Fully Automatic System (no need for periodic weight sampling for calibration)
- Weight Variation R of below 1% of control weight

Gob Shape Recording · Retrieval · Comparison

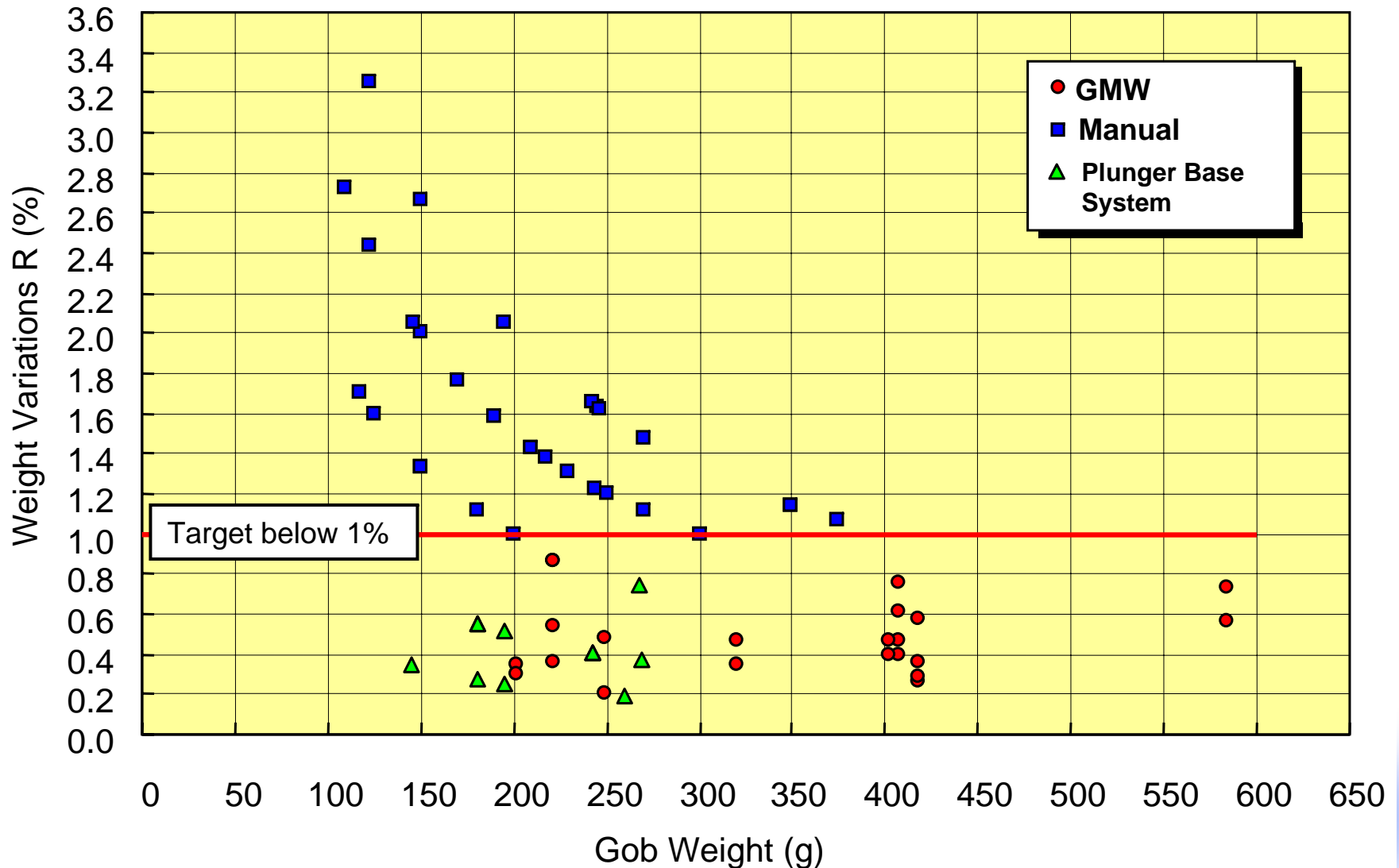
Gob Measurement Trend Data · Recording · Retrieval

- Gob Volume
- Gob Length
- Gob Fall Angle
- Feeder Tube Height Adjustment
- Drop Consistency

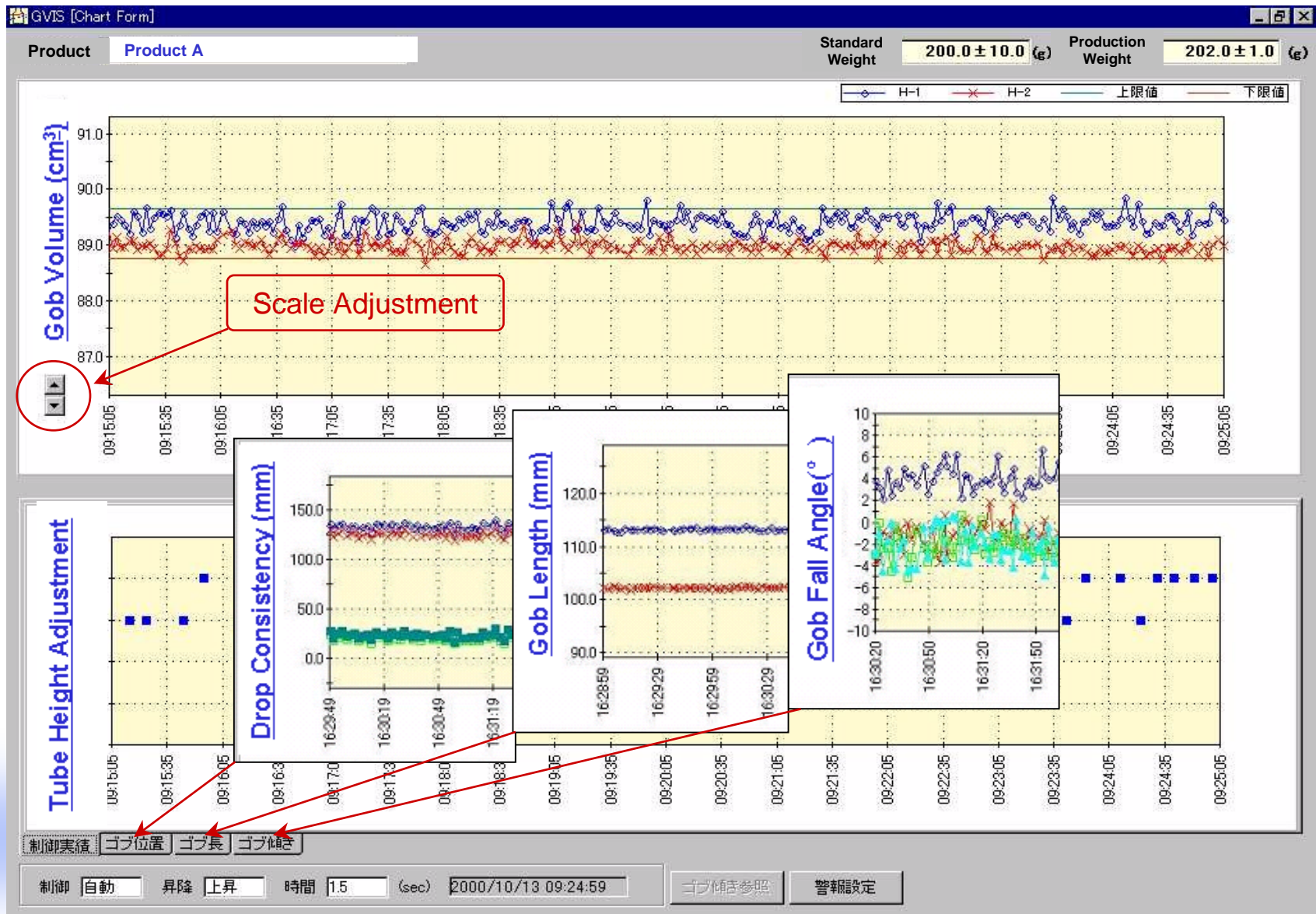
Alarm Functions

- Trend Graph Data
- Camera Water Jacket Temperature
- Camera Lens Air Purge Pressure

Automatic Control Performance



Gob Volume & Trend Graph



Tool Bar Function



Gob Shape Window

Gob volume, Fall angle, Gob length

Gob Comparison

Product Name: Product A
Production Date: October 12, 2000 10:05:12

(H-1)
Volume : 185.20cm³
Drop Angle : 2.5 °
Length : 145.2cm³

(H-2)
Volume : 181.50cm³
Drop Angle : 3.2 °
Length : 150.2cm³

Gob



Save

Gob Upload

Gob Capture

Close

Product Name: Product B
Production Date: October 15, 2000 13:10:14

(H-1)
Volume : 170.30cm³
Drop Angle : 2.5 °
Gob Length : 142.1cm³

(H-2)
Volume : 168.10cm³
Drop Angle : 2.7 °
Gob Length : 147.6cm³

Gob



Save

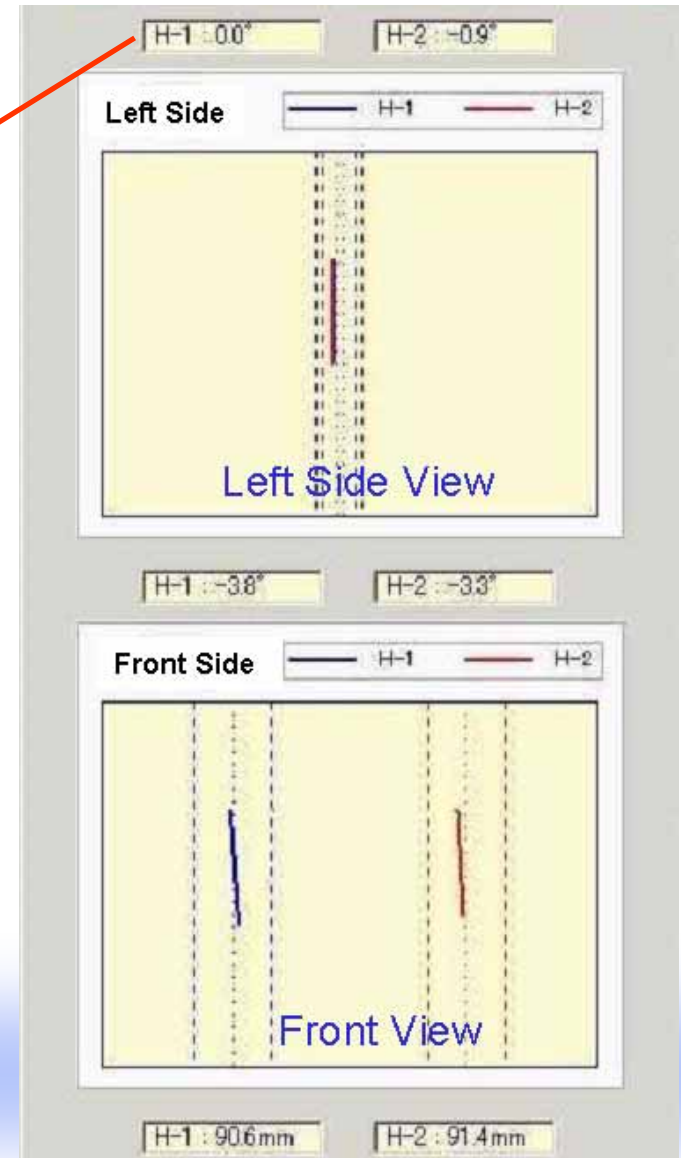
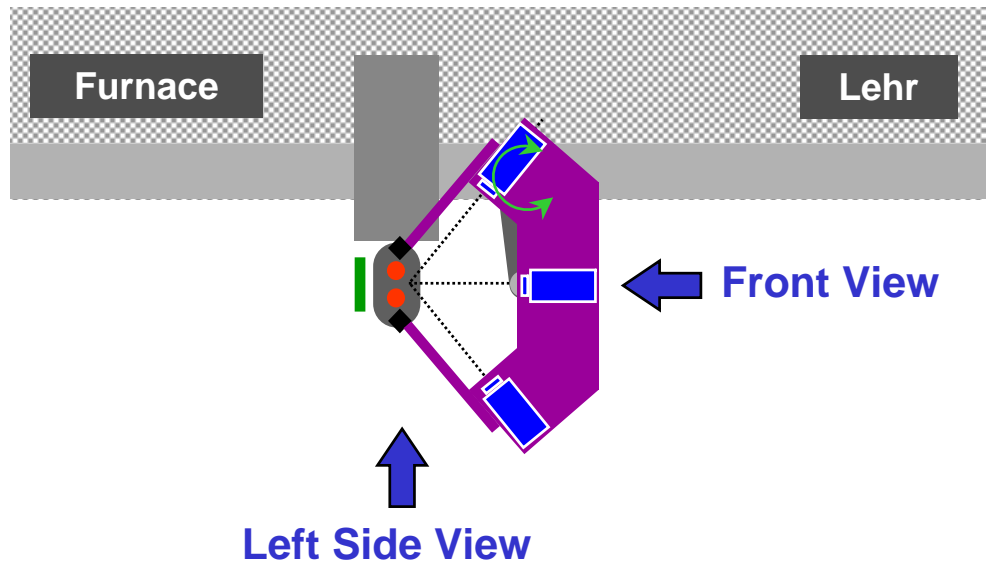
Gob Upload

Gob Capture

30th ASEAN Glass Conference Manila, Philippines Sept. 21, 2006

 NIHON YAMAMURA GLASS CO., LTD.

Gob Fall Angle



Alarm Setting Window


GVIS Alarm Settings

Weight | Length | Fall Angle | Drop Cons. | FT Control | Data Comm

Control Limit : \pm 20.0 (g)

No. of times : 010

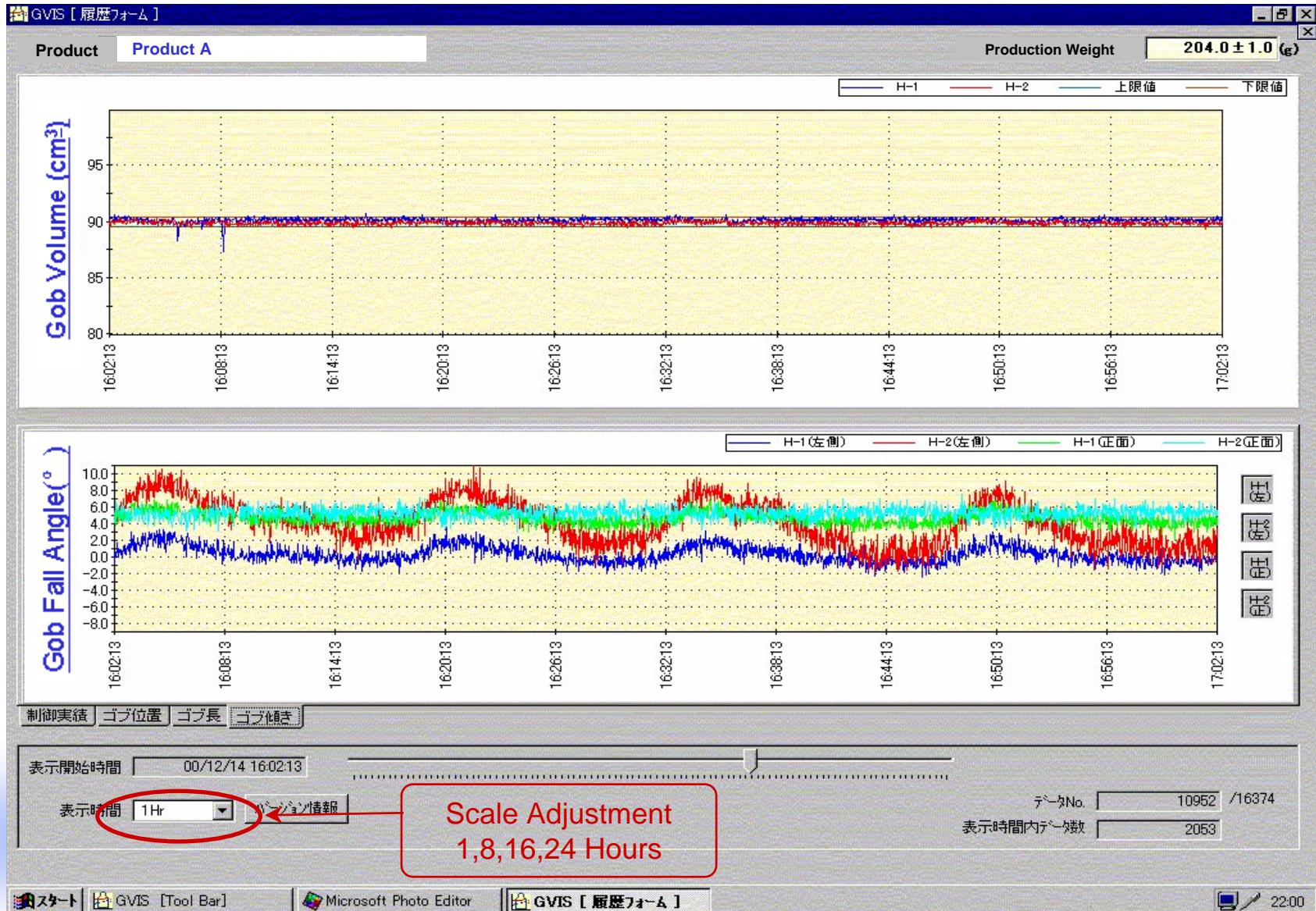
Alarm

 **Gob Weight Alarm,
Feeder Control Alarm**

OK

Cancel Confirm

Historical Trend Data



Job Change Data

Job Change Data

Product Data

Product

Product C

Standard Weight

206.0 ± 10.0 (g)

Production Weight

206.0 ± 1.0 (g)

Glass Density

2.2649 (g/cm³)

New Job

Upload

Close

Job Change Database

The screenshot shows a software window titled "Database" with a close button (X) in the top right corner. Inside the window, there is a section labeled "Product List" containing a scrollable list of products from "Product A" to "Product M". Below the list, there are three input fields for data entry: "Standard Weight" with the value "247 ± 10" and unit "(g)", "Production Weight" with the value "247 ± 1" and unit "(g)", and "Glass Density" with the value "2.26" and unit "(g/cm³)". At the bottom of the window, there are four buttons: "Modify", "Delete", "Upload", and "Close".

Database

Product List

- Product A
- Product B
- Product C
- Product D
- Product E
- Product F
- Product G
- Product H
- Product I
- Product J
- Product K
- Product L
- Product M

Standard Weight: (g)

Production Weight: (g)

Glass Density: (g/cm³)

Modify **Delete** **Upload** **Close**

Summary

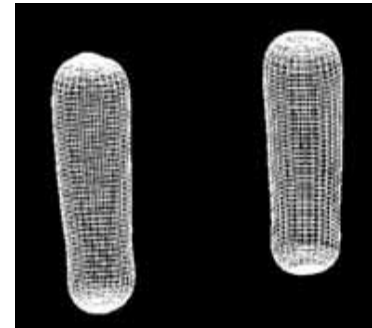
GMW System



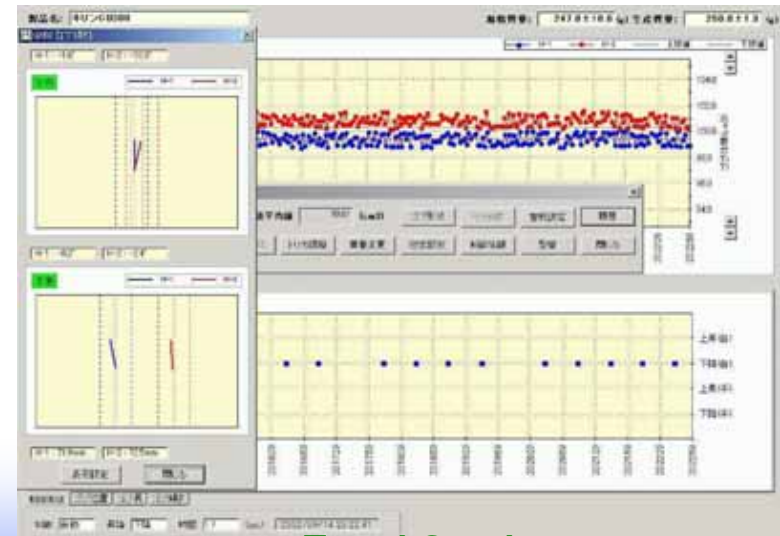
Compact Housing Unit



Control Panel



3D Wire
Frame Image



Trend Graph

Summary

1. The GMW system helps contribute to stable production and improve quality.

- Fully Automatic System

No need for periodic weight sampling for calibration.
This means more time for defects correction

- Stable gob weight control

Applicable for BB, PB, NNPB process

Weight variation R of below 1% of control weight

- Job change repeatability

Gob images and other numerical parameters helps facilitates job change setup

- Better gob loading & delivery

Continuous monitoring of gob length, fall angle & drop consistency for early identification of loading & delivery problems

Summary

2. Repeatable gob shape & weight, stable gob weight are important factors in achieving light weighting and non-swabbing technology.
3. By linking the gob image data with servo-driven mechanism, automatic gob forming is possible.