HIGH TEMPERATURE CAMERA IDENTIFICATION SOFTWARE

Part of ES 4.0 and a key component towards Industry 4.0

GLASS SERVICE

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CONTENT

- GS Camera
- Furnace Measurement
- Tin Bath Measurement
- ES IV
- Date Acquisition Software
- Browser

Glass Service Company Structure Worldwide
HQ Vsetin, Czech Republic (total approx 100 employees)

Glass Service USA
USA

Glass Service B.V.
The Netherlands

GS ACT
Slovakia

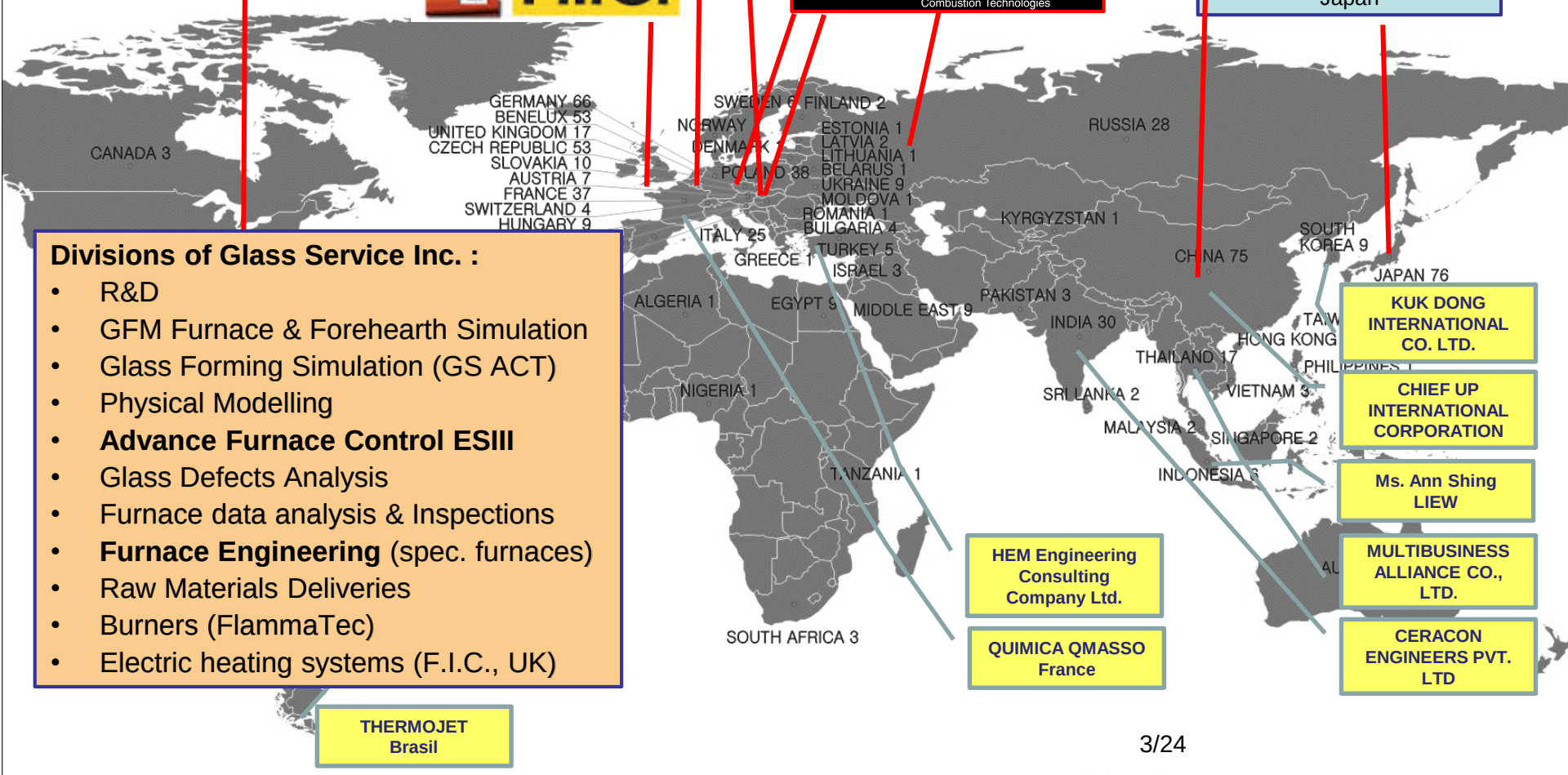
GS Russia
Russia

GS CHINA Ltd.
China

CERAMIC FORUM
Japan

F.I.C.

FLAMMATEC® Combustion Technologies



Divisions of Glass Service Inc. :

- R&D
- GFM Furnace & Forehearth Simulation
- Glass Forming Simulation (GS ACT)
- Physical Modelling
- **Advance Furnace Control ESIII**
- Glass Defects Analysis
- Furnace data analysis & Inspections
- **Furnace Engineering** (spec. furnaces)
- Raw Materials Deliveries
- Burners (FlammaTec)
- Electric heating systems (F.I.C., UK)

THERMOJET
Brasil

HEM Engineering Consulting Company Ltd.

QUIMICA QMASSO
France

KUK DONG INTERNATIONAL CO. LTD.

CHIEF UP INTERNATIONAL CORPORATION

Ms. Ann Shing LIEW

MULTIBUSINESS ALLIANCE CO., LTD.

CERACON ENGINEERS PVT. LTD

Total number of GS LABORATORY CUSTOMERS: 790

WE OPTIMIZE YOUR INDIVIDUAL PRODUCTION CONDITIONS.

Advanced solutions for Glass Melting, Conditioning, Forming

more than **50'000** defects analyses

more than **650** furnace optimizations

more than **160** expert systems

ASSESSMENT

SIMULATIONS

3D advanced CFD simulation of the complete high temp. glass melting process for regenerator, melter, forehearth and forming.
more

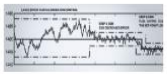
LAB SERVICES

Quick identification of glass defects and their origin to support quality improvements and operating parameter optimization.
more

AUDITS & DATA ANALYSES

Analyzing production, observing critical conditions and identifying optimization potential.
more

PROCESS CONTROL



EXPERT SYSTEM *ES ///*™

Full automatic process control resulting in stable operations, improved yield, reduced production costs and emissions.
more

PRODUCTS

ENGINEERING

Turn-key design and supply of specialized furnaces with high quality demands (for lenses, LCD or crystal).
more

RAW MATERIALS

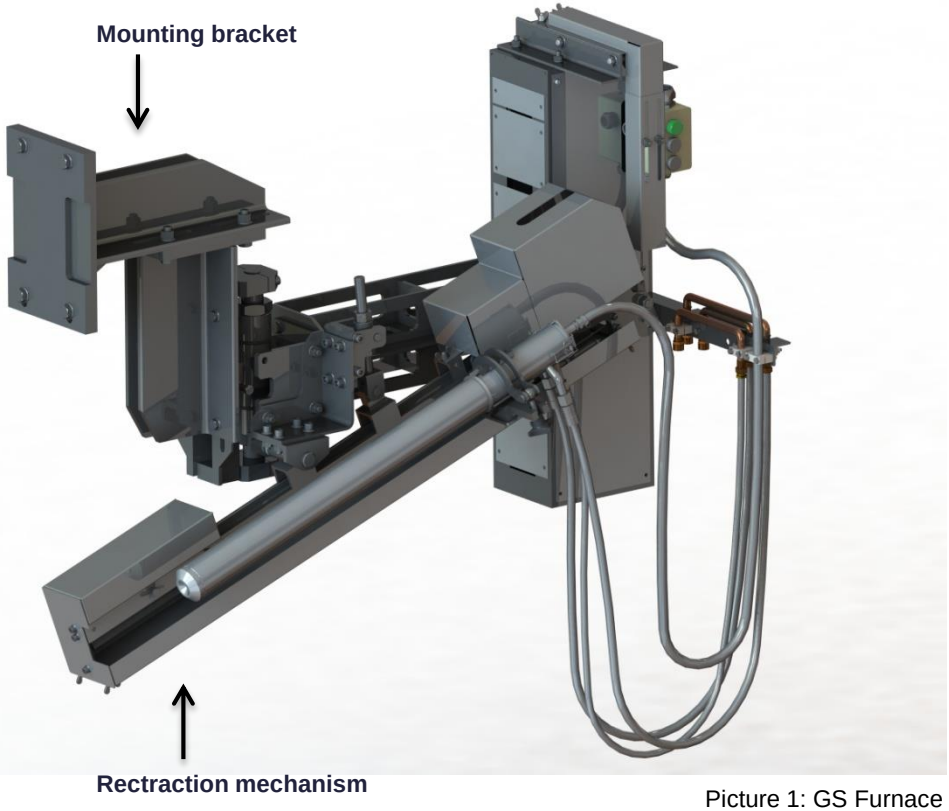
Provide glass producers with Commodities, Specialties, Rare Earth Oxides and Polishing Compounds.
more

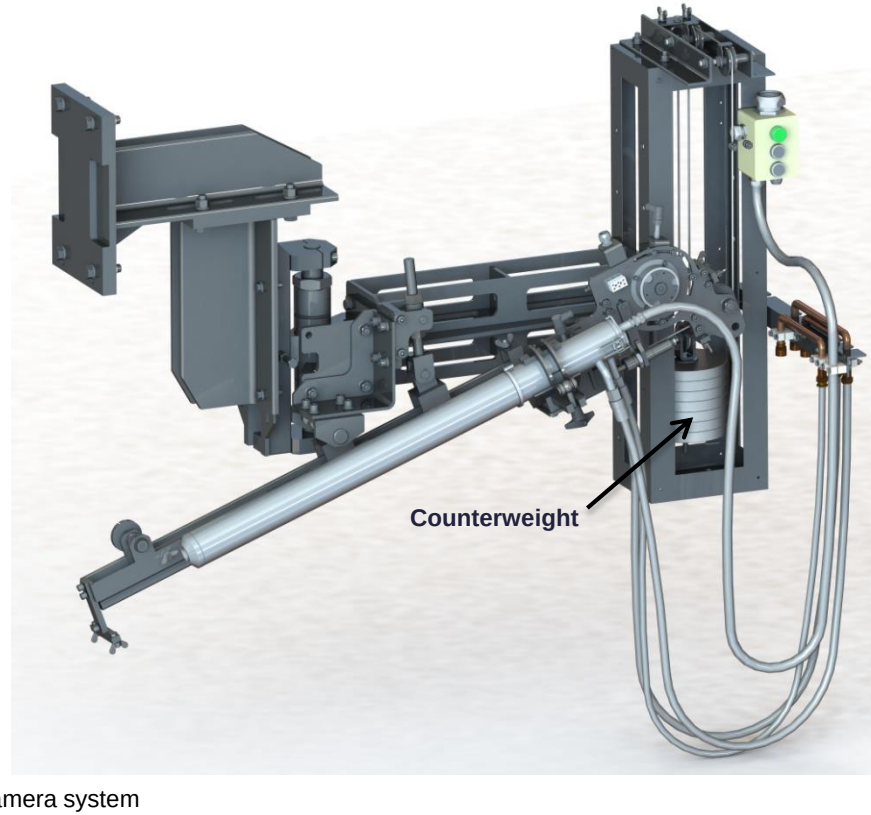
Why GS Camera turns ESIII into ES 4.0

- Present Trend of Industry 4.0 is motivating glass production for further automation of the glass melting process
- Part of the glass melting process such as the batch blanket spread in most furnaces and Glass Ribbon in Tin Float baths relies on operator visual regular inspection and his personal interpretation, followed by some decision making
- Even your TOP management understands that this cannot continue like this in the near future

GS CAMERA

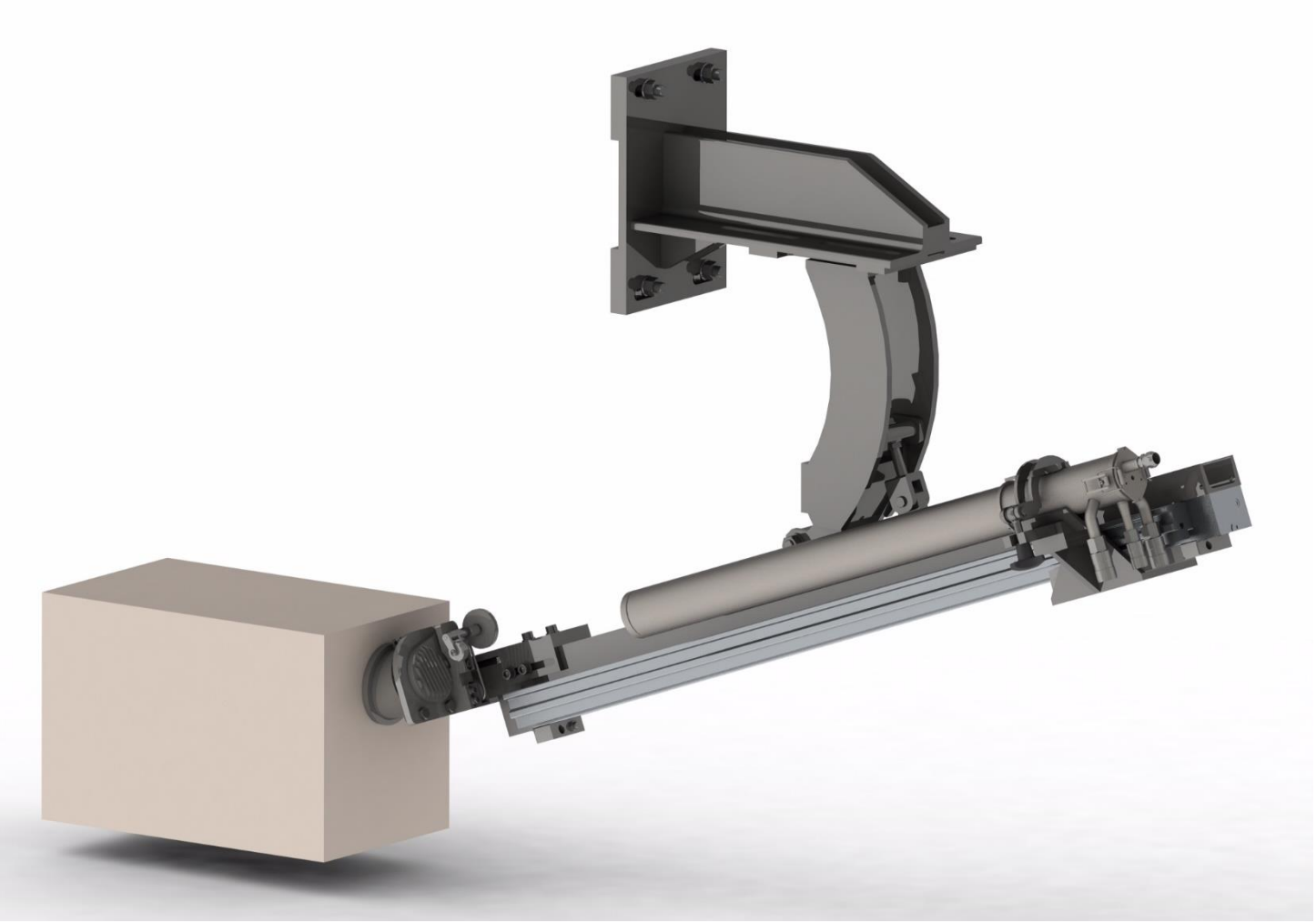
- IP camera – enhanced, high resolution and clear images
- Standard solution with retraction system for glass furnaces
- Standard solution for tin bath
- Motivation to our own camera software years ago





Picture 1: GS Furnace camera system

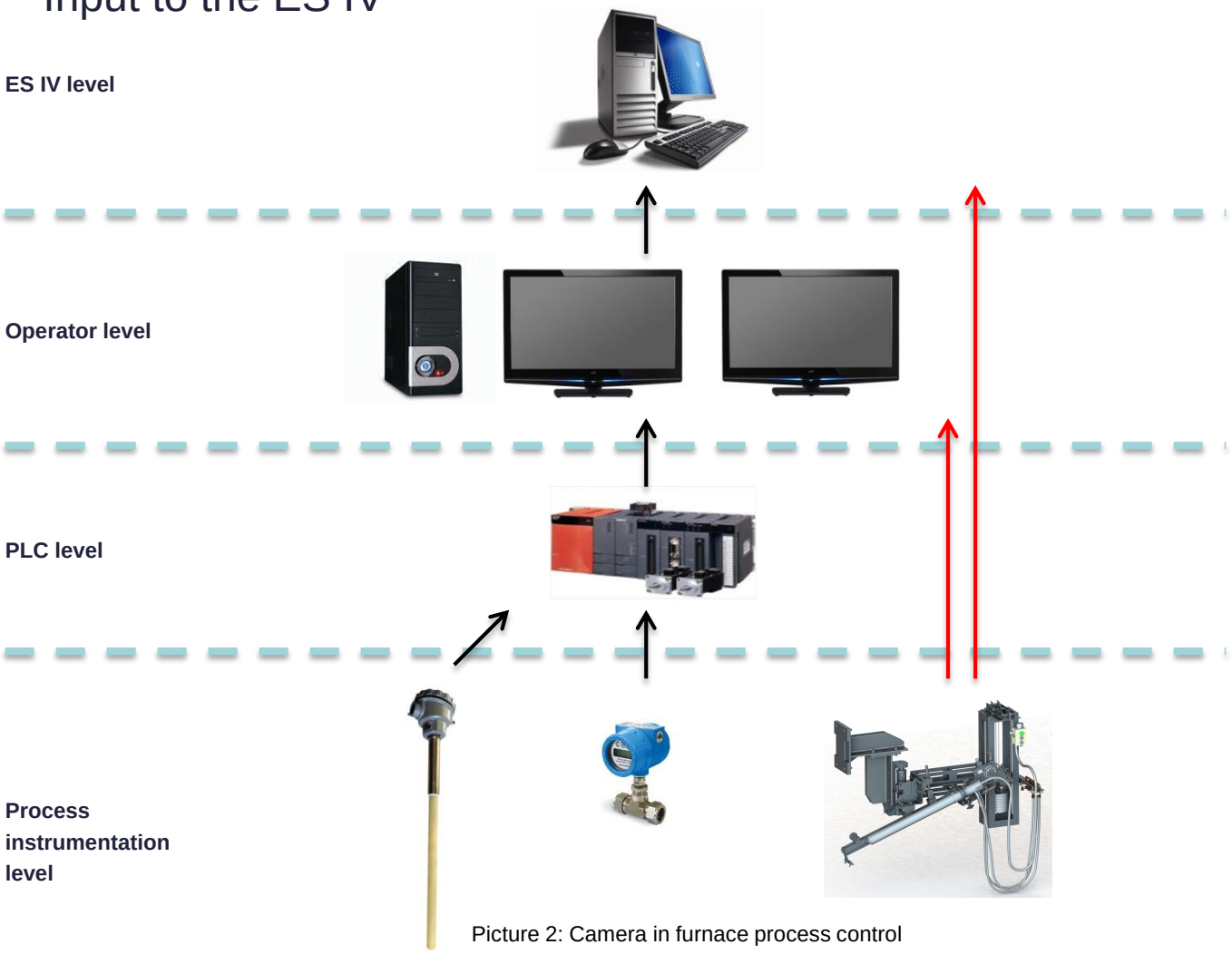
- Updated cam with electronic retraction system



Picture 1a: GS New Furnace camera system

CAMERAS IN FURNACE PROCESS CONTROL

- Monitoring
- Input to the ES IV



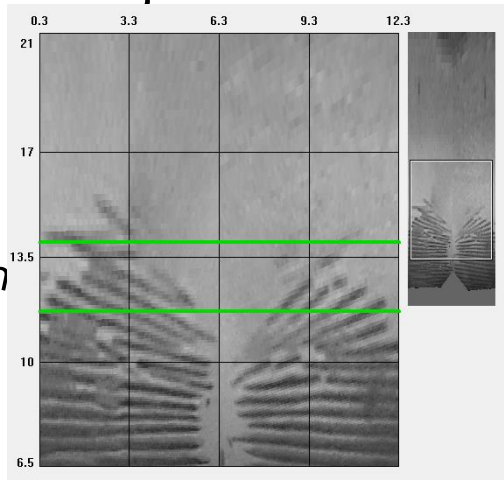
Picture 2: Camera in furnace process control

ES III™ CAMERA - OVERVIEW

+

Correspondence between the real world and the images

Projection



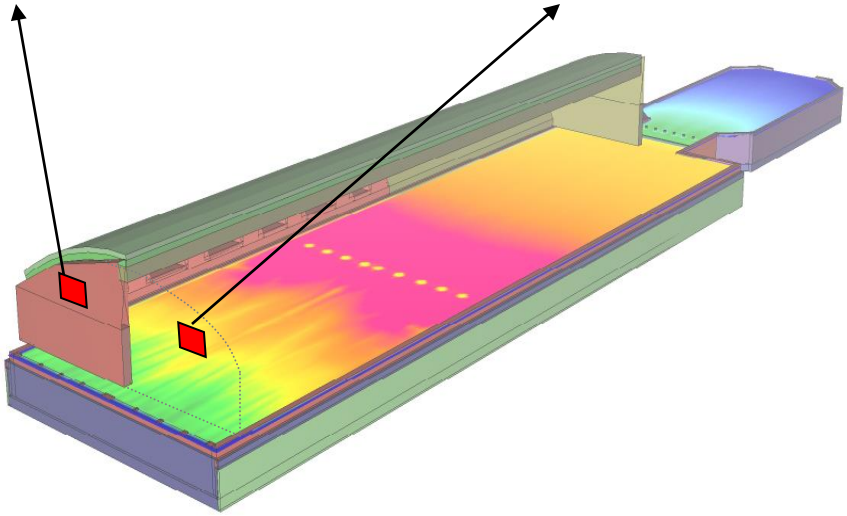
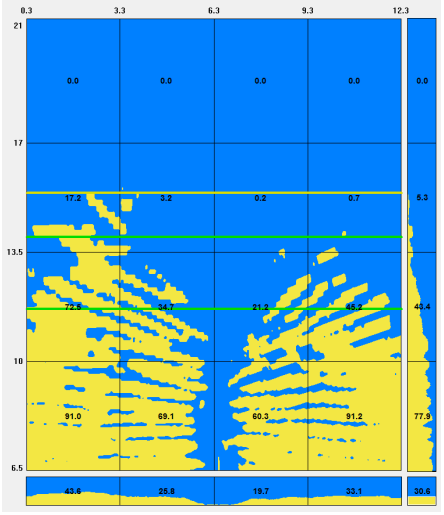


Image processing

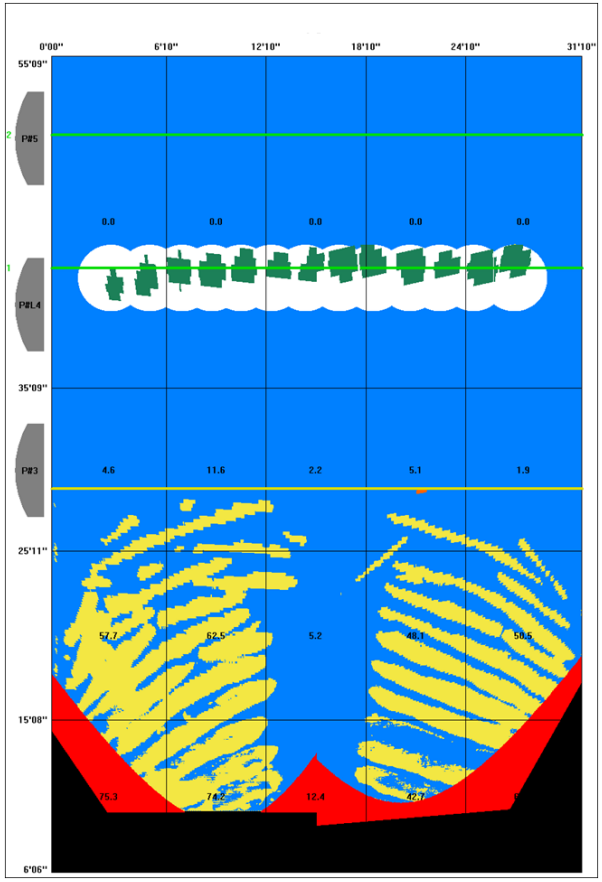


Measured data, statistics, analysis

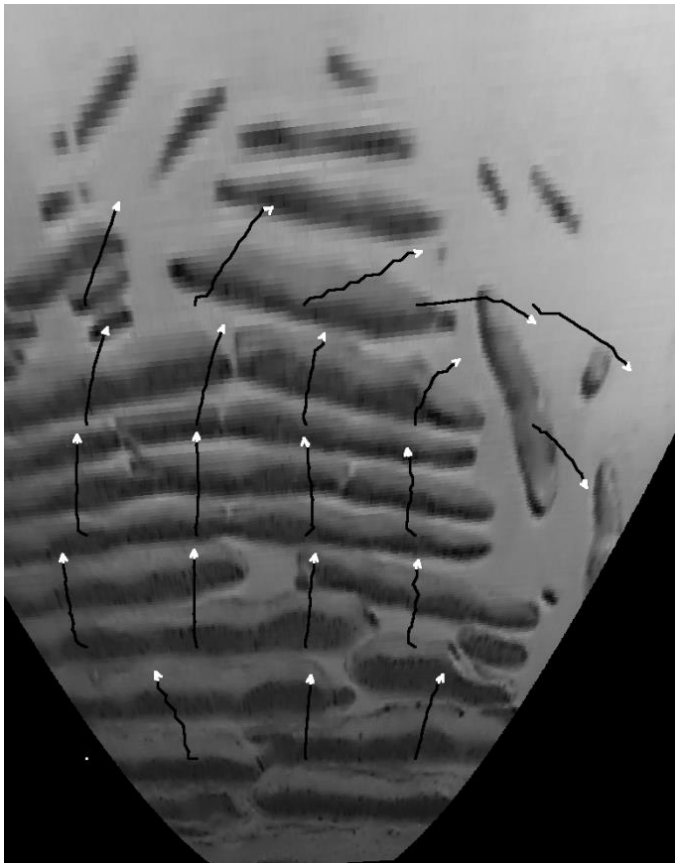
Analyzing via picture archive easy long term video

FLOAT FURNACE BATCH MEASUREMENT

- Bubblers position and size detection
- Batch flow direction and velocity



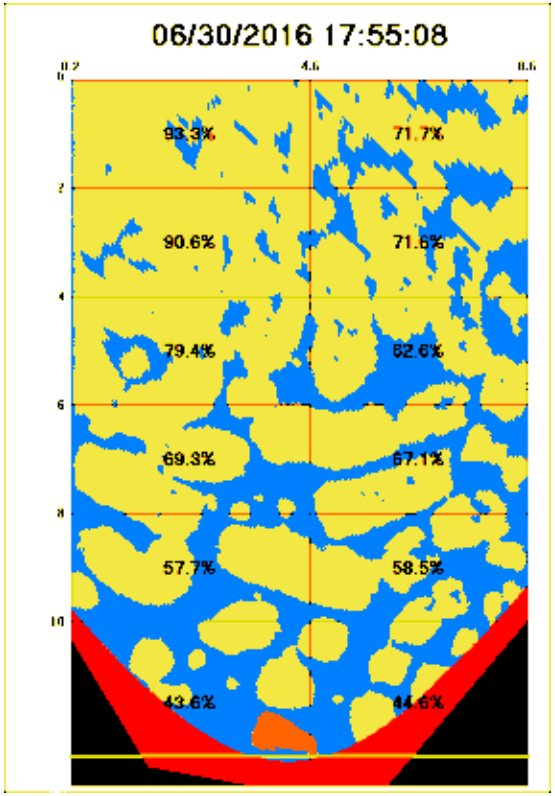
Picture 5: Bubblers measurement

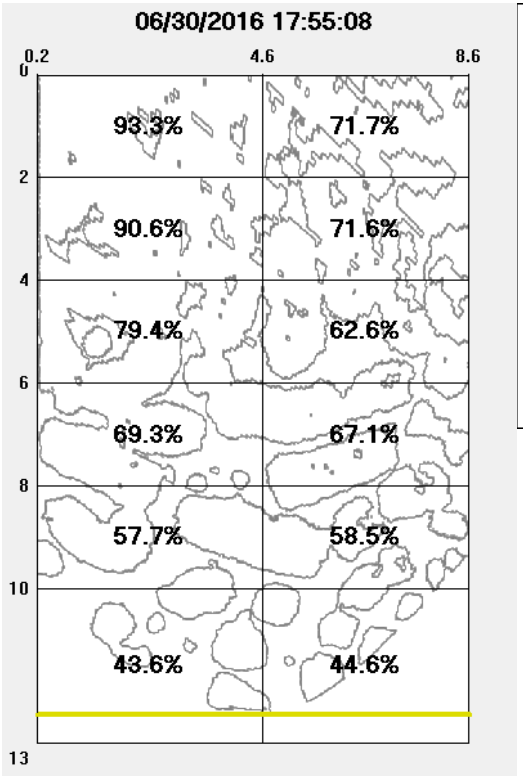


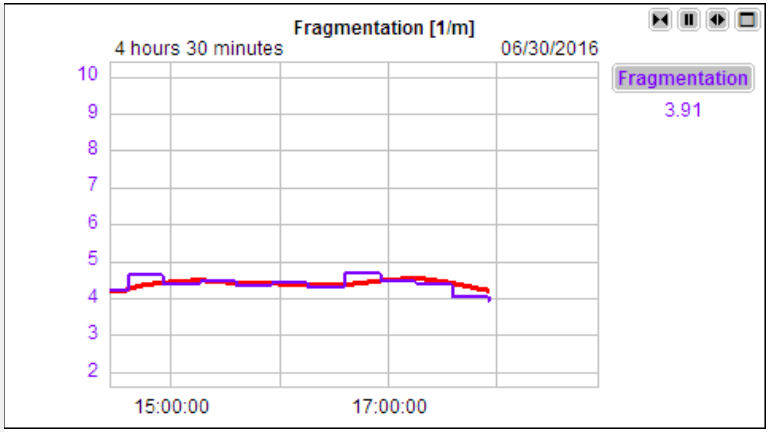
Picture 6: Batch flow measurement

CONTAINER FURNACE MEASUREMENT

- Batch coverage / Batch periphery = Batch fragmentation

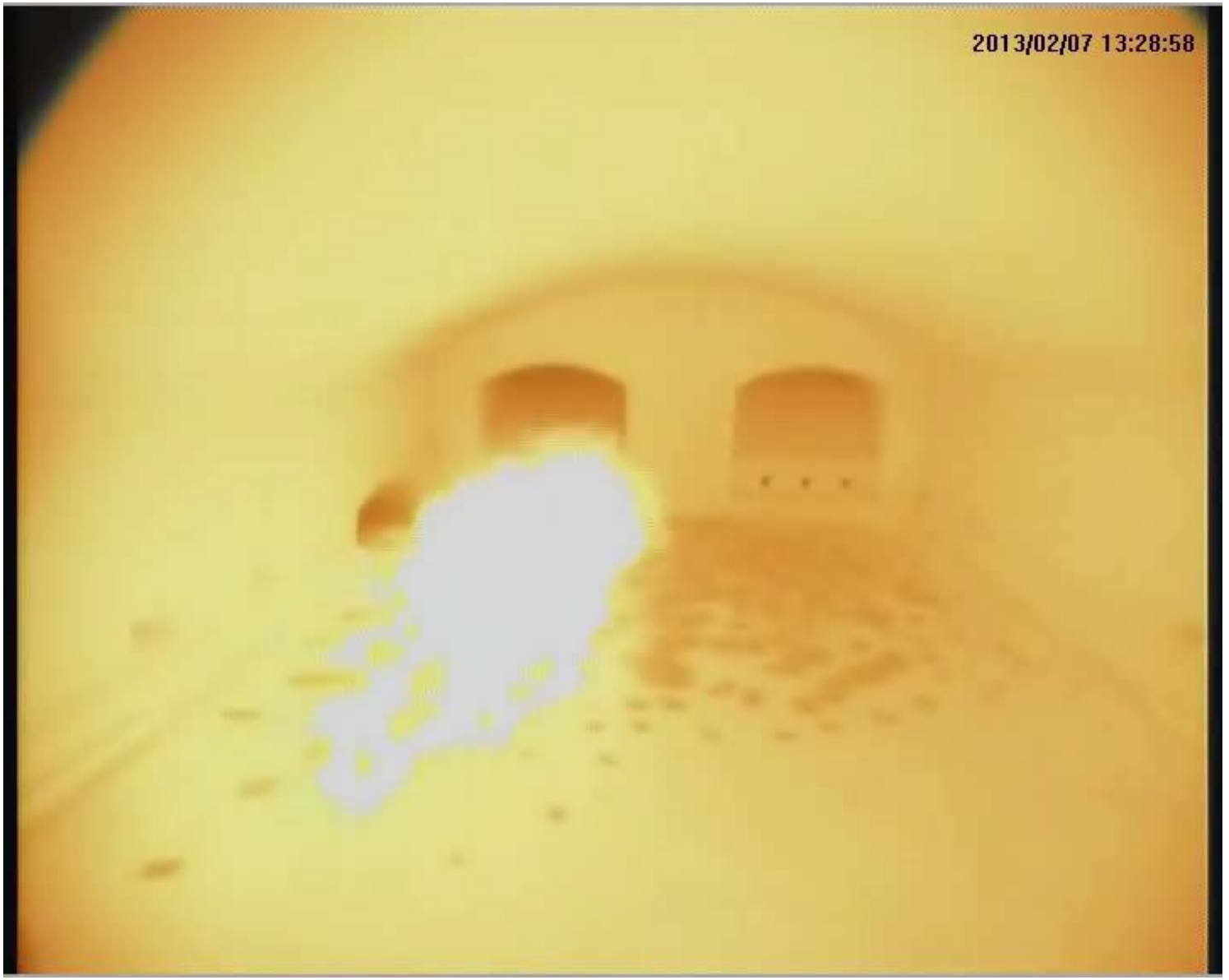






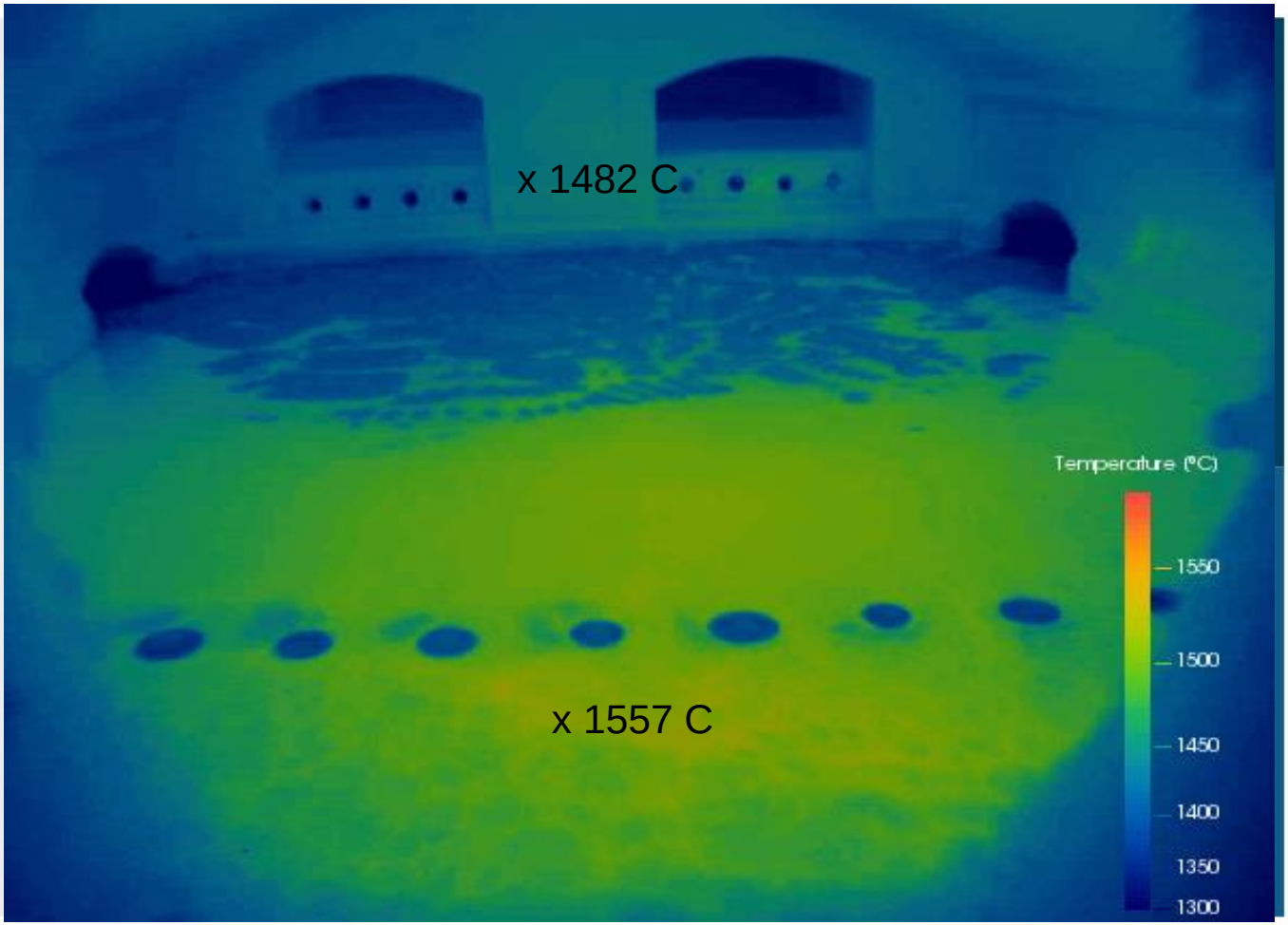
Picture 7: Container furnace measurement

Analyzing via picture archive (easy) long term video



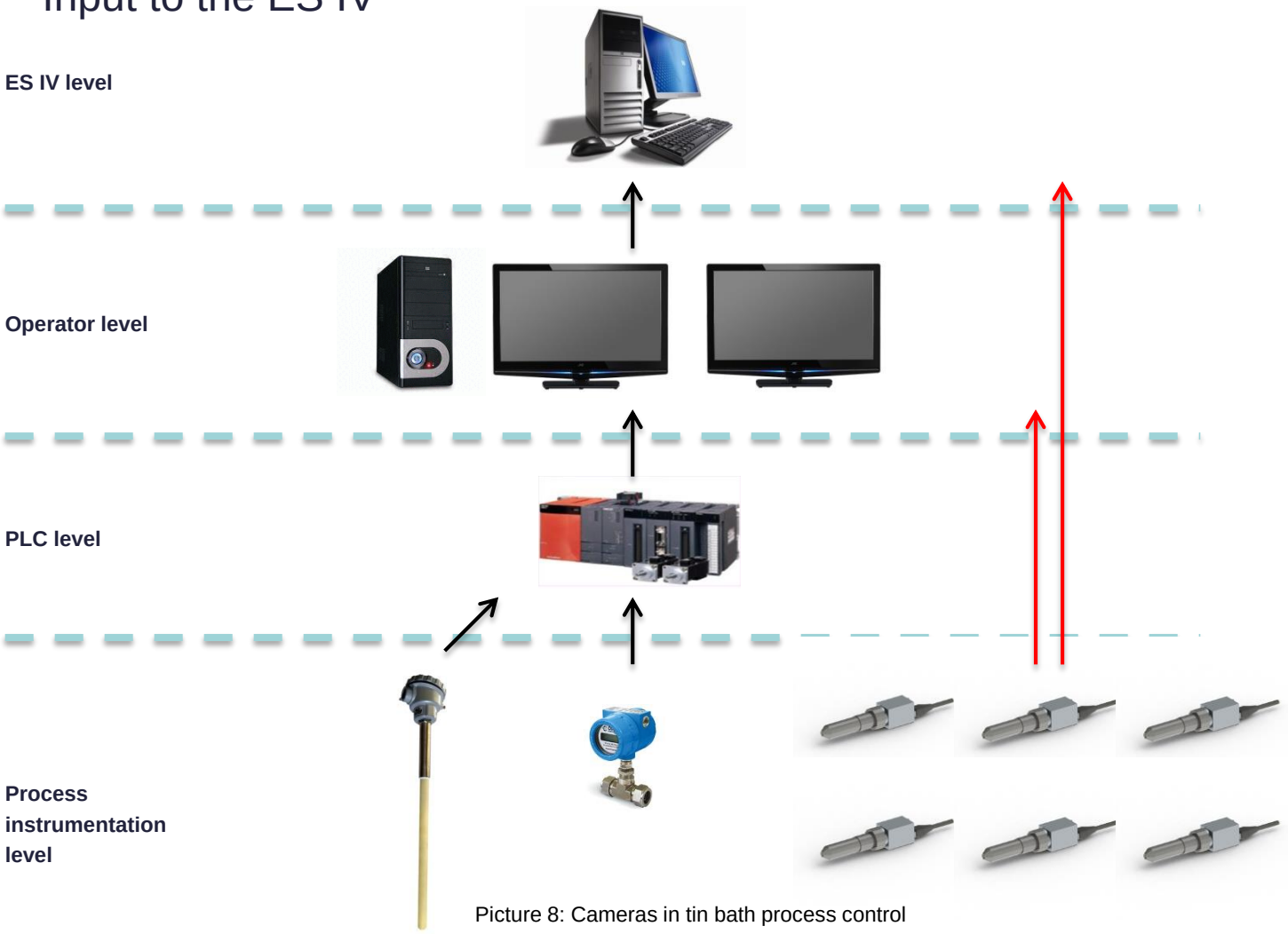
A-Sens new camera solution

- New GS Augmented-Sens camera provides 2 video streams: regular vision information plus calibrated temperatures using Infrared parallel



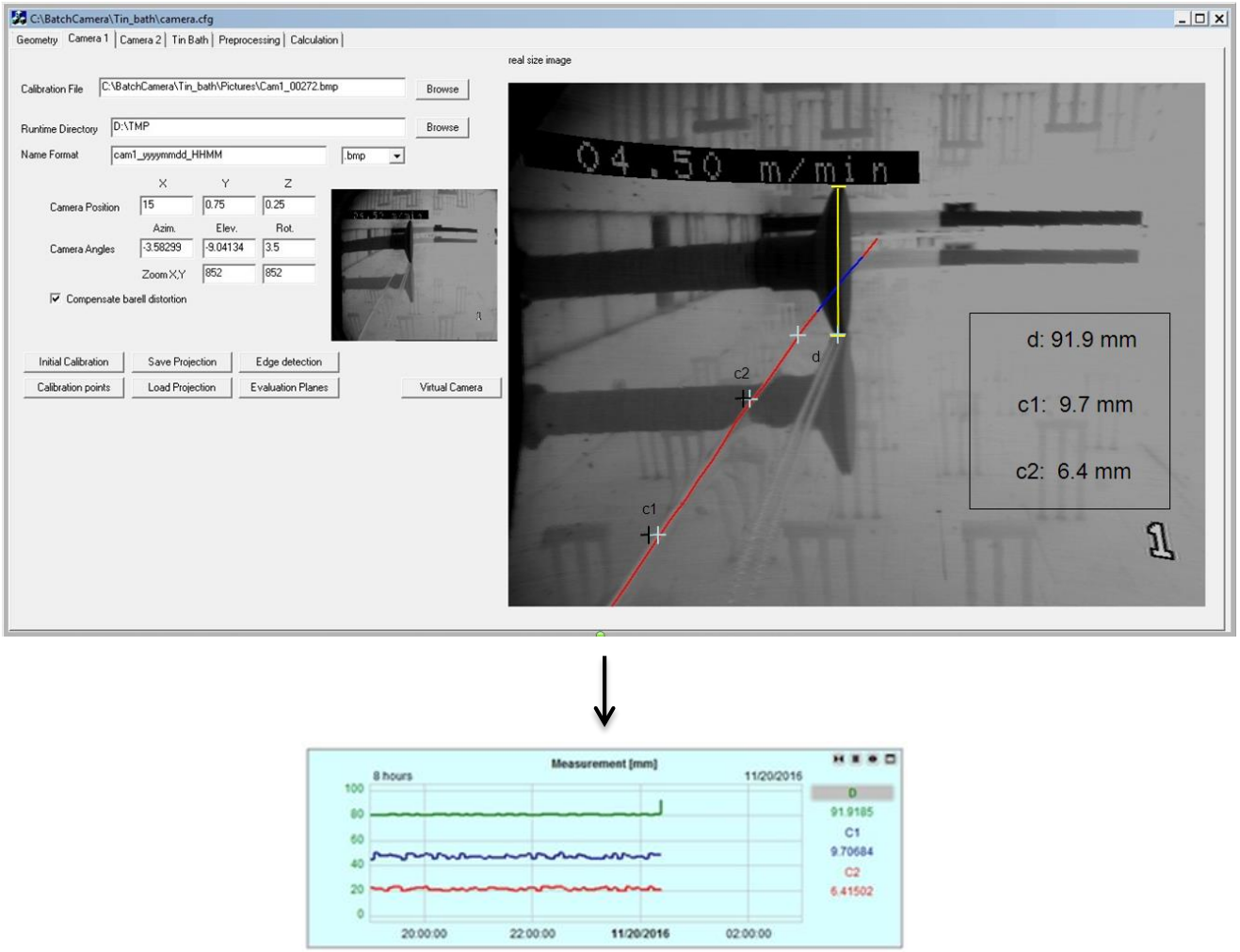
CAMERAS IN TIN BATH PROCESS CONTROL

- Monitoring
- Input to the ES IV



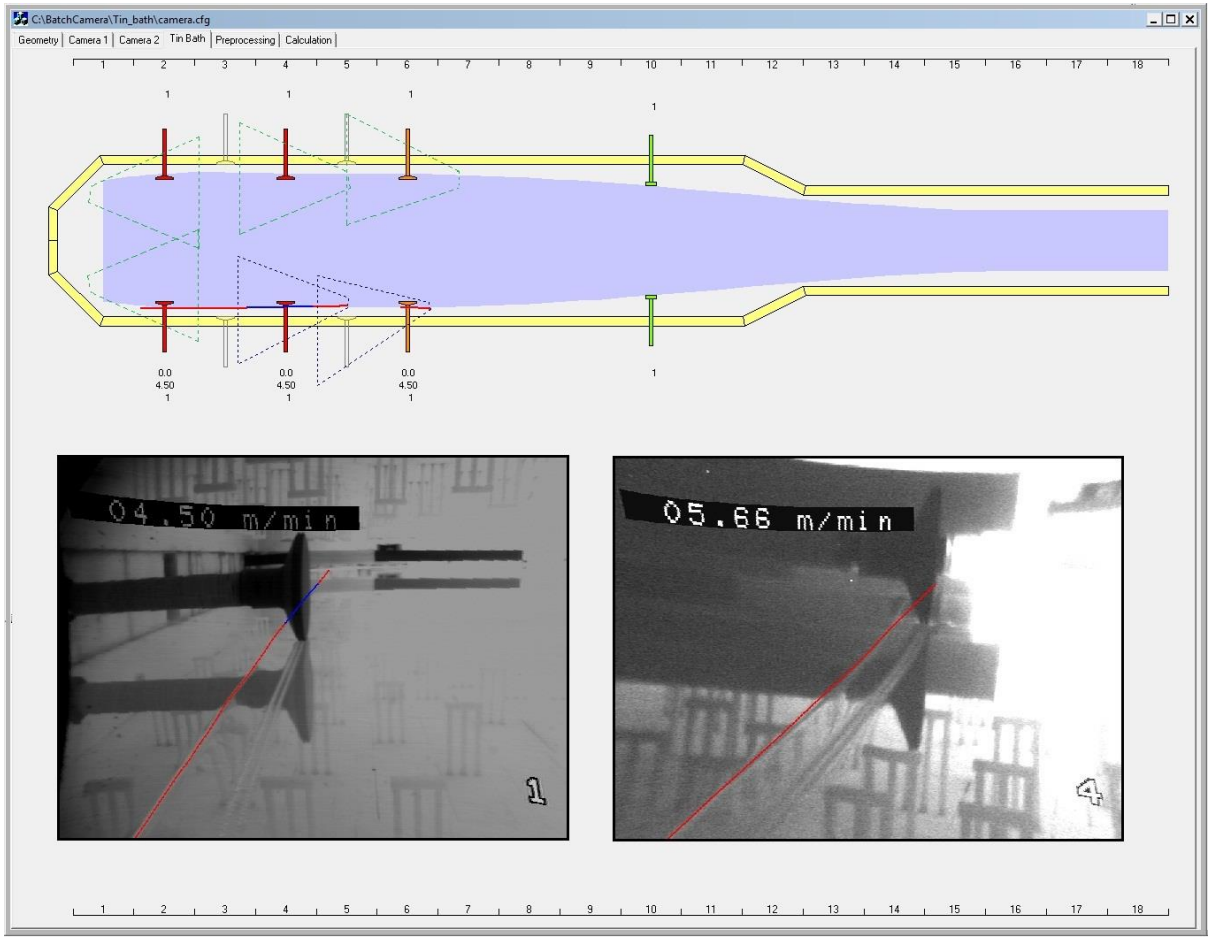
Picture 8: Cameras in tin bath process control

- Ribbon edge detection



Picture 9: Ribbon edge detection

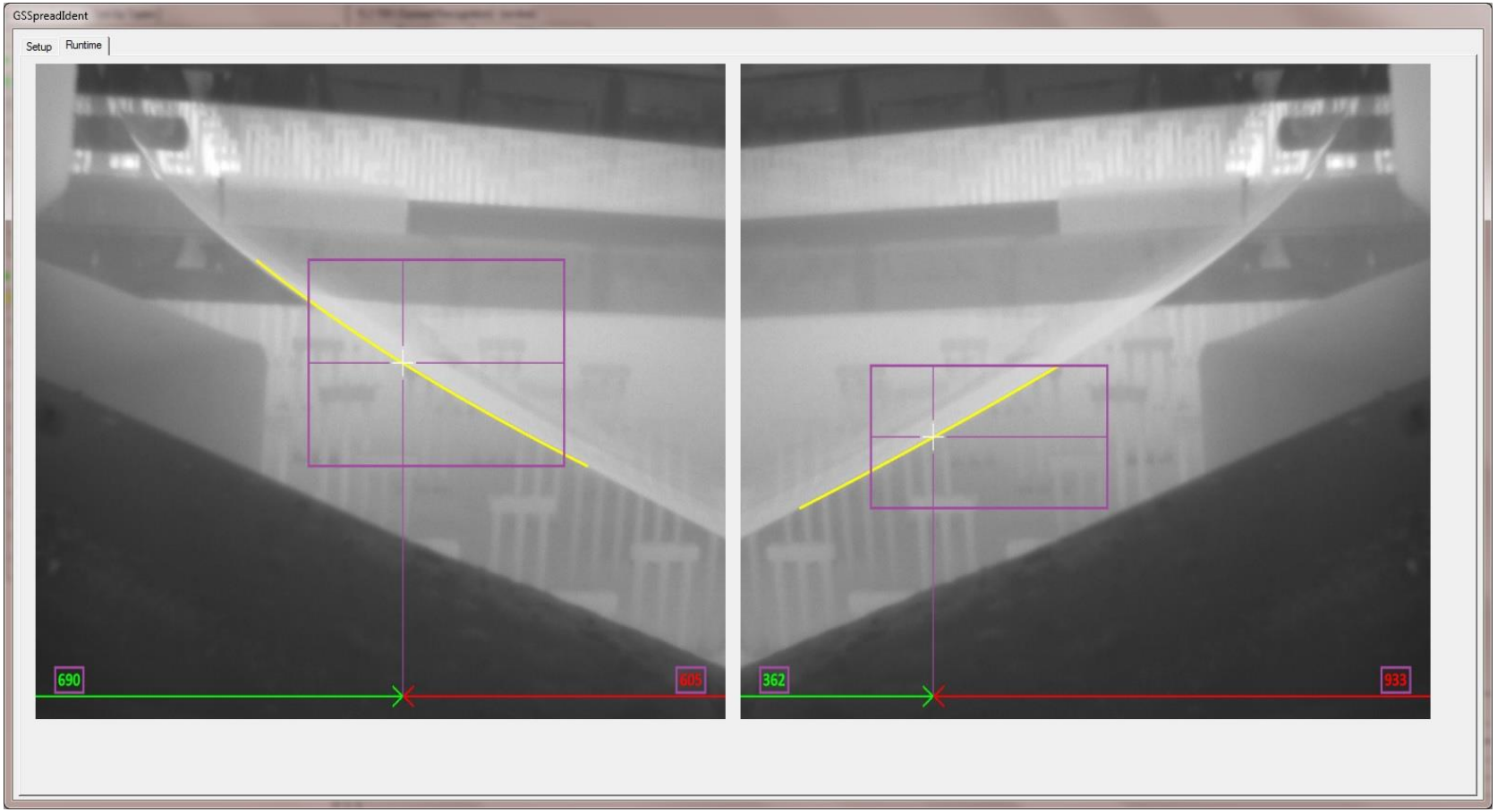
- Recreate Ribbon Top overview



Picture 10: Ribbon overview

TIN BATH MEASUREMENT

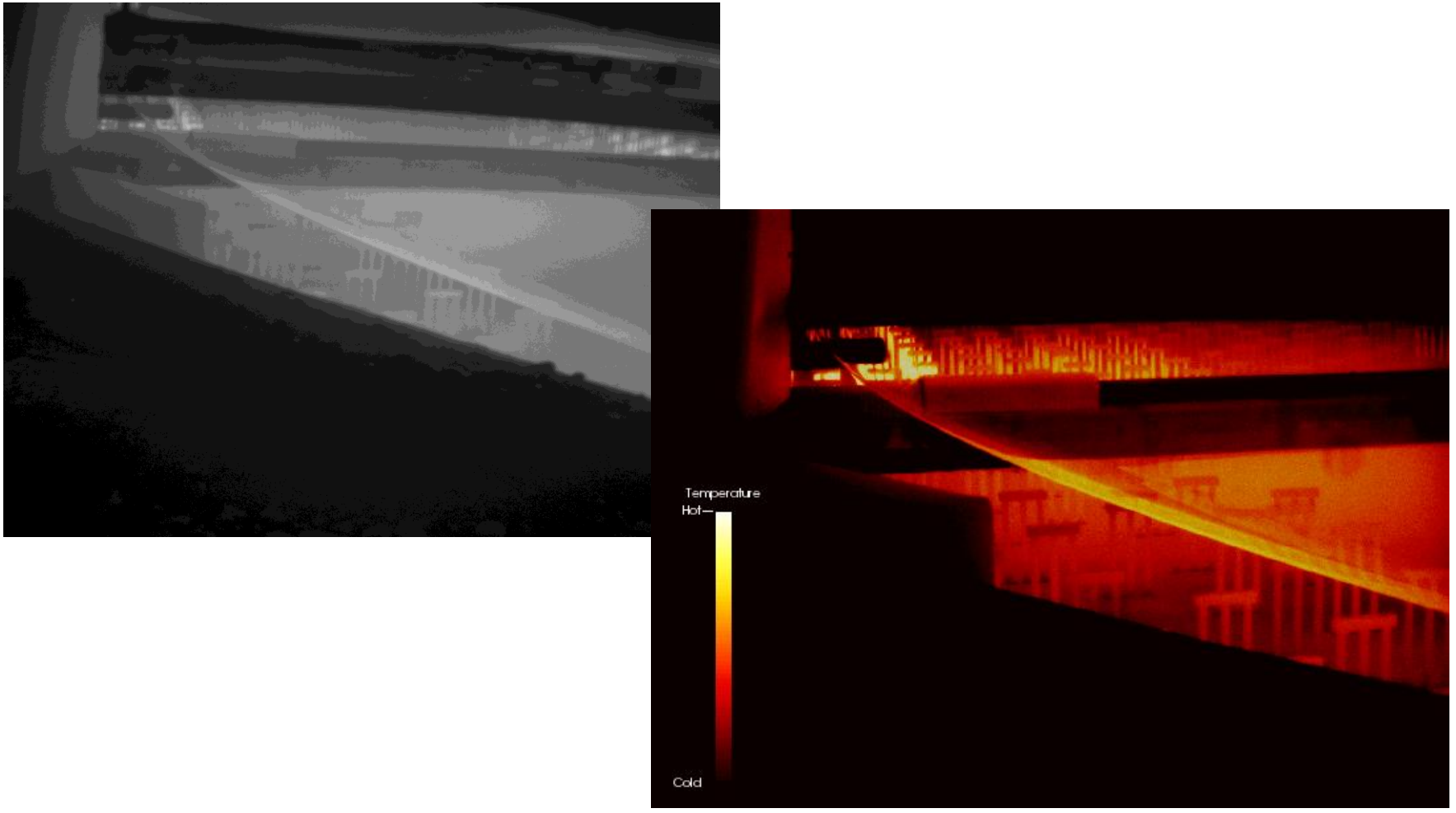
- Automatic Spread detection (and control)



Picture 11: Spread detection

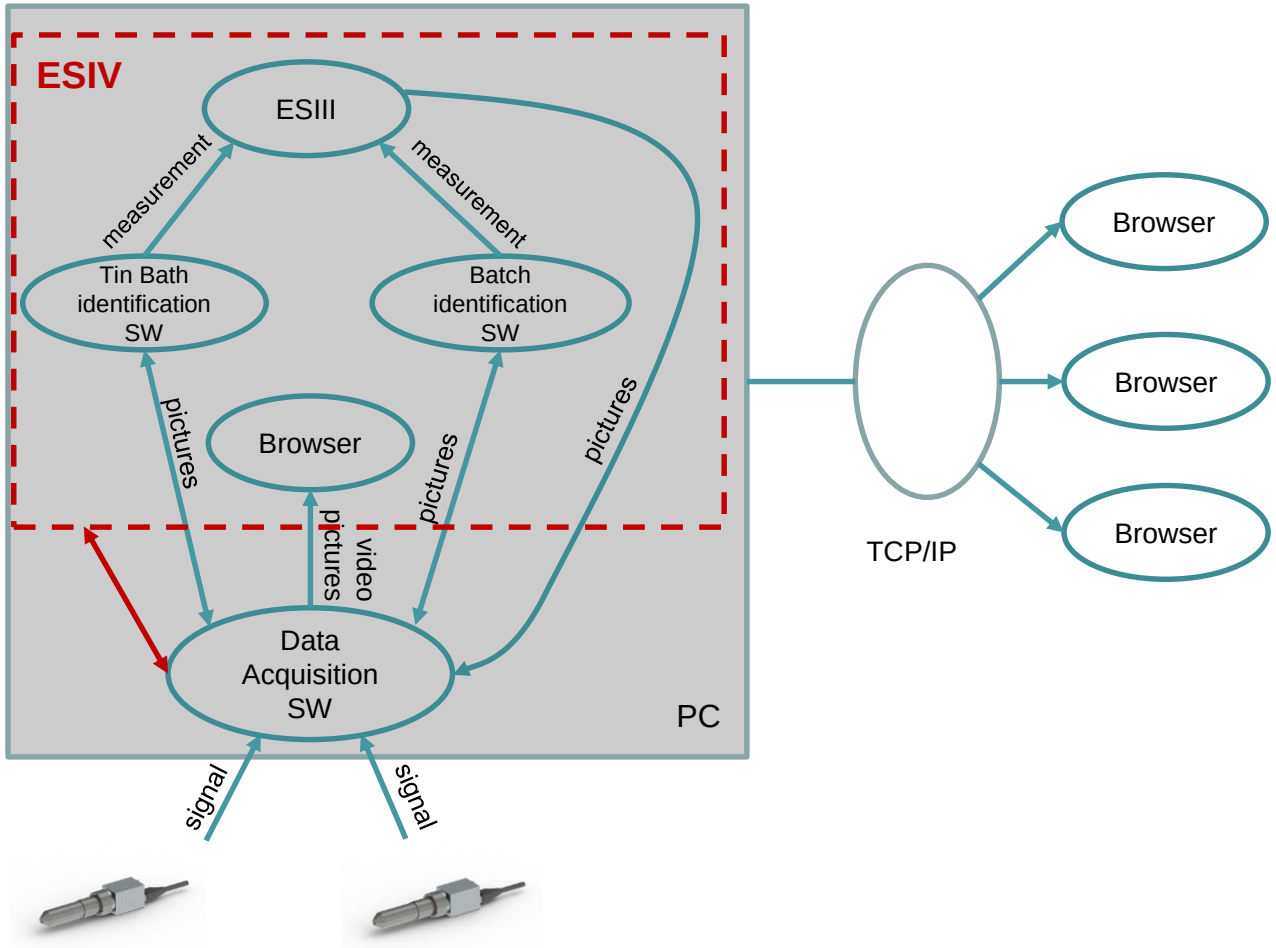
TIN BATH MEASUREMENT

- Using IR camera for spread detection, improved detection



Picture 12: Ribbon Spread detection IR camera

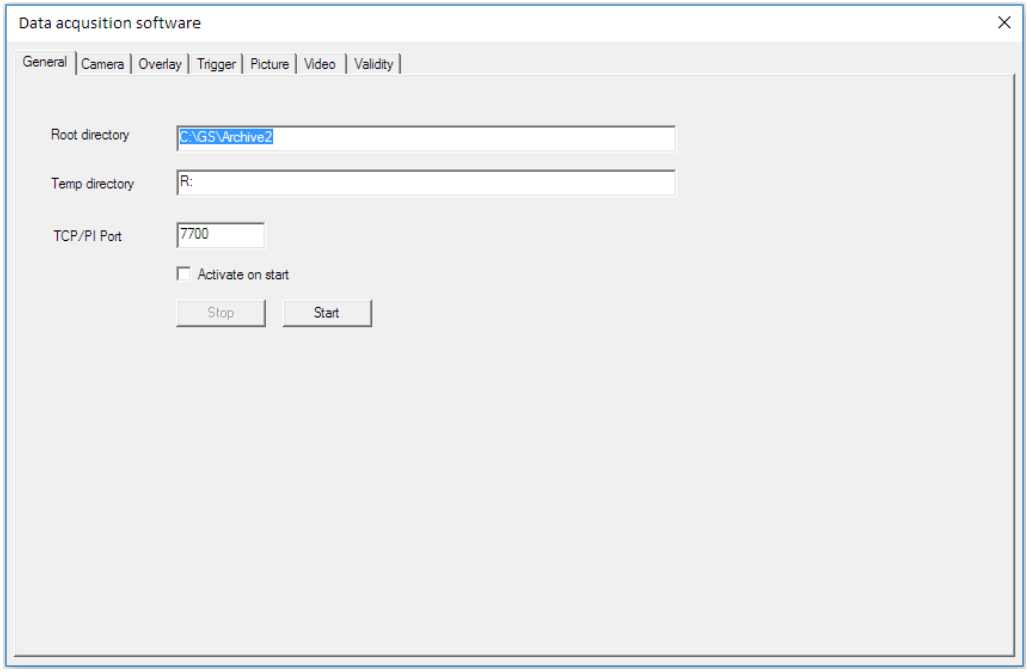
- High temperature camera identification software integration into ES IV



Picture 12: ES IV

DATA ACQUISITION SOFTWARE

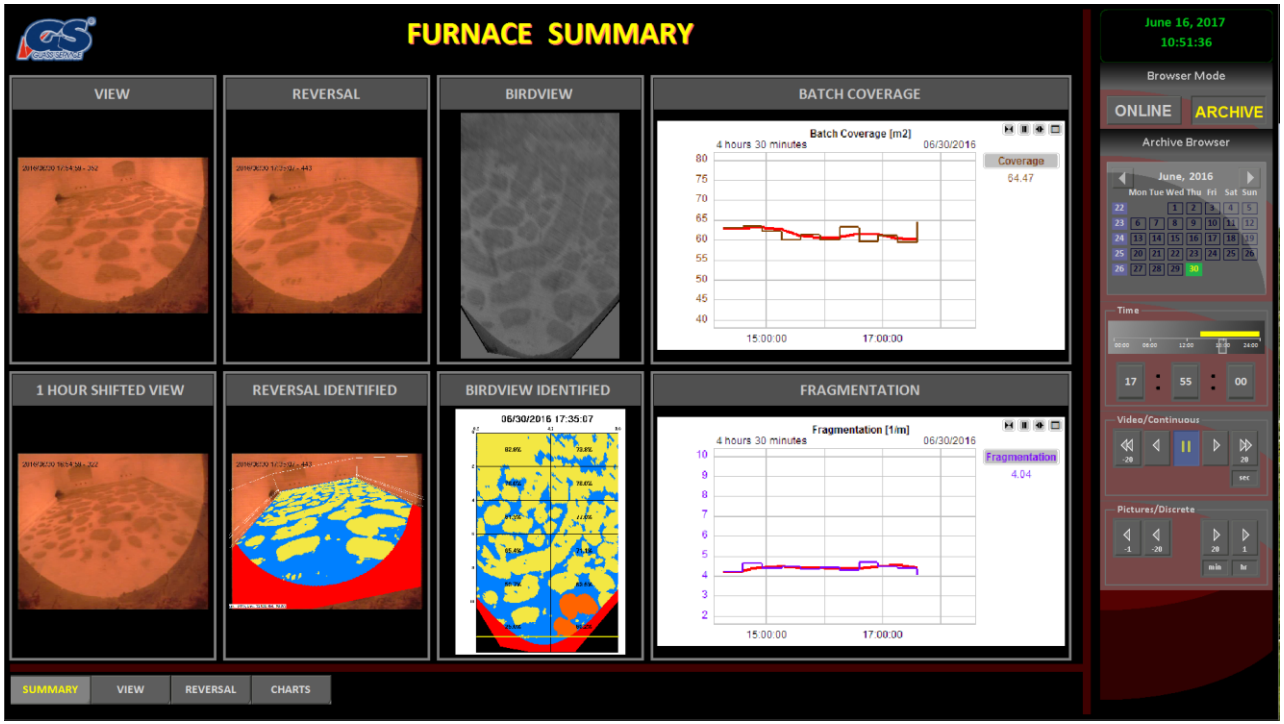
- Separated TCP/IP server application
- Multiple camera inputs
- Collecting and storing pictures and videos
- Intelligent data archive manager
- Automatic flame identification



Picture 13: Data acqusition software

BROWSER

- TCP/IP client integrated in ES IV
- Might be used separately also
- Viewing and history browsing pictures and videos
- Fast playing forward and backward possibility
- Multiple monitors and screens can be defined



Picture 14: Browser

THANK YOU FOR ATTENTION !

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