See degrees differently.

From Fire to Insight: AI Transforming Glass Furnace Operations with NIRB technology

Philippe Kerbois – Global Industry Manager

Glassman 2026 – Mexico – May 2026

Short Introduction

- Global Industry Manager - Glass

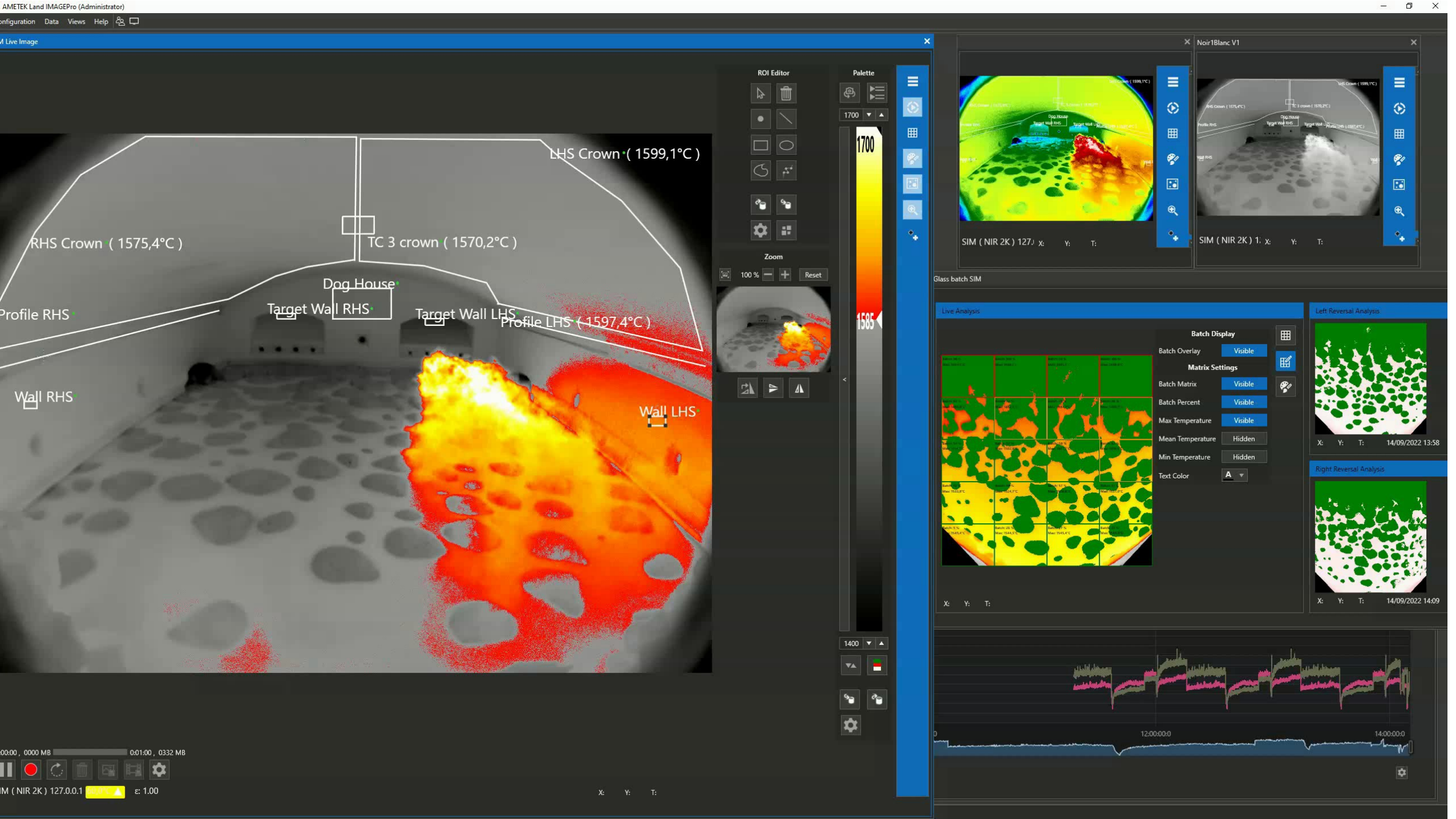
- Philippe has extensive sales and project management experience from working in the steel, glass and automotive industries including Rockwell Automation and ABB where he was specifically involved in major robot-based factory automation projects.
- Having worked at AMETEK Land since 2012, Philippe initially managed the sales of infrared temperature measurement solutions into line builders and glass and steel furnace OEMs within France, however now he works very closely with the global glass market and is actively promoting the award-winning Near Infrared Borescope (NIR-B) Glass thermal imaging solution for glass furnaces.

- philippe.kerbois@ametek.com
- +33 (0) 6.75.38.39.87

LAND portfolio – complete temperature offering

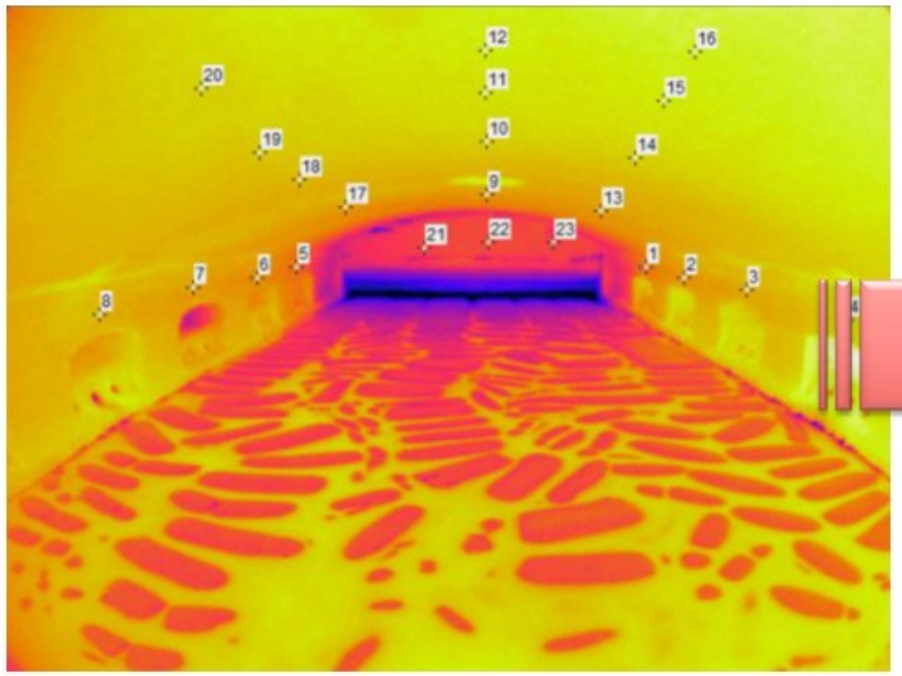
- Leverage demand for the NIR-Borescope to promote a wider portfolio packages including :
- The Fiber Optics “Legend FG” for forehearth and furnaces
- FLTs and LSP-HDs for thin bath and Lehrs
- LWIR-640 cameras for glass leak detection and refractory monitoring (Regens)
- As installation becomes more critical – possible to integrate and provide AMEcare
  - Advanced Services into the offering
- Thermal Surveys with NIR-b-2K demonstrating benefits of NIR-b
- More than 200 NIR-b’s implemented Worldwide in major producers in the Glass industry

AMECARE
PERFORMANCE SERVICES


AMETEK Land IMAGEPro (Administrator)
Configuration
Data
Views
Help
M Live Image
LHS Crown (1599,1°C)
RHS Crown (1575,4°C)
TC 3 crown (1570,2°C)
Dog House
Profile RHS
Target Wall RHS
Target Wall LHS
Profile LHS (1597,4°C)
Wall RHS
Wall LHS
ROI Editor
Palette
1700
1585
1400
Zoom
100 %
Reset
Noir1Blanc V1
SIM (NIR 2K) 127.
SIM (NIR 2K) 1
Glass batch SIM
Live Analysis
Batch Display
Batch Overlay
Visible
Matrix Settings
Batch Matrix
Visible
Batch Percent
Visible
Max Temperature
Visible
Mean Temperature
Hidden
Min Temperature
Hidden
Text Color
Left Reversal Analysis
14/09/2022 13:58
Right Reversal Analysis
14/09/2022 14:09
12:00:00:0
14:00:00:0
IM (NIR 2K) 127.0.0.1
ε: 1.00

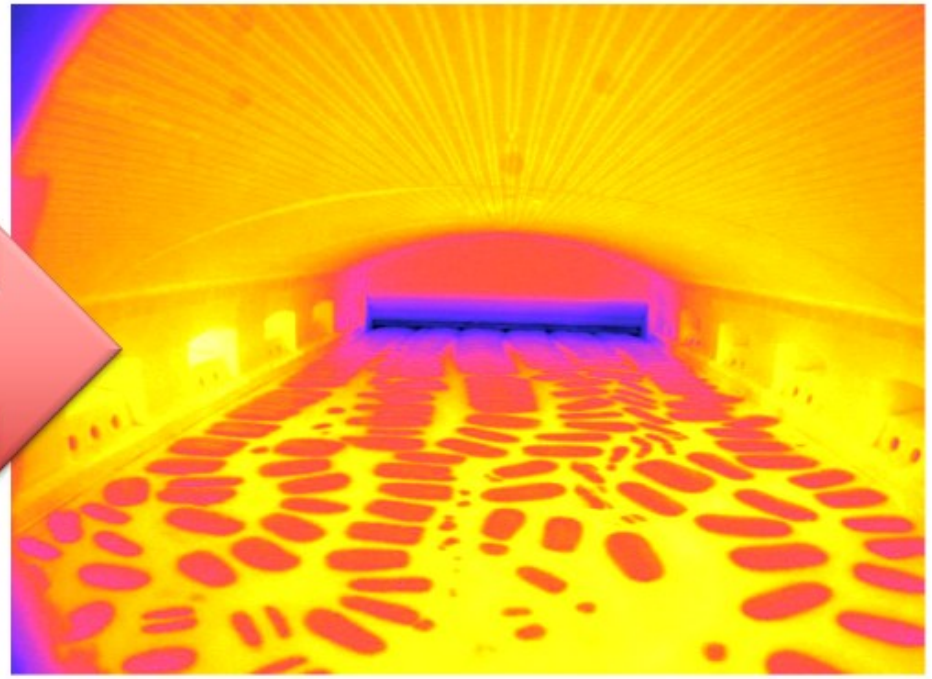
Introducing NIR-b-2K HD

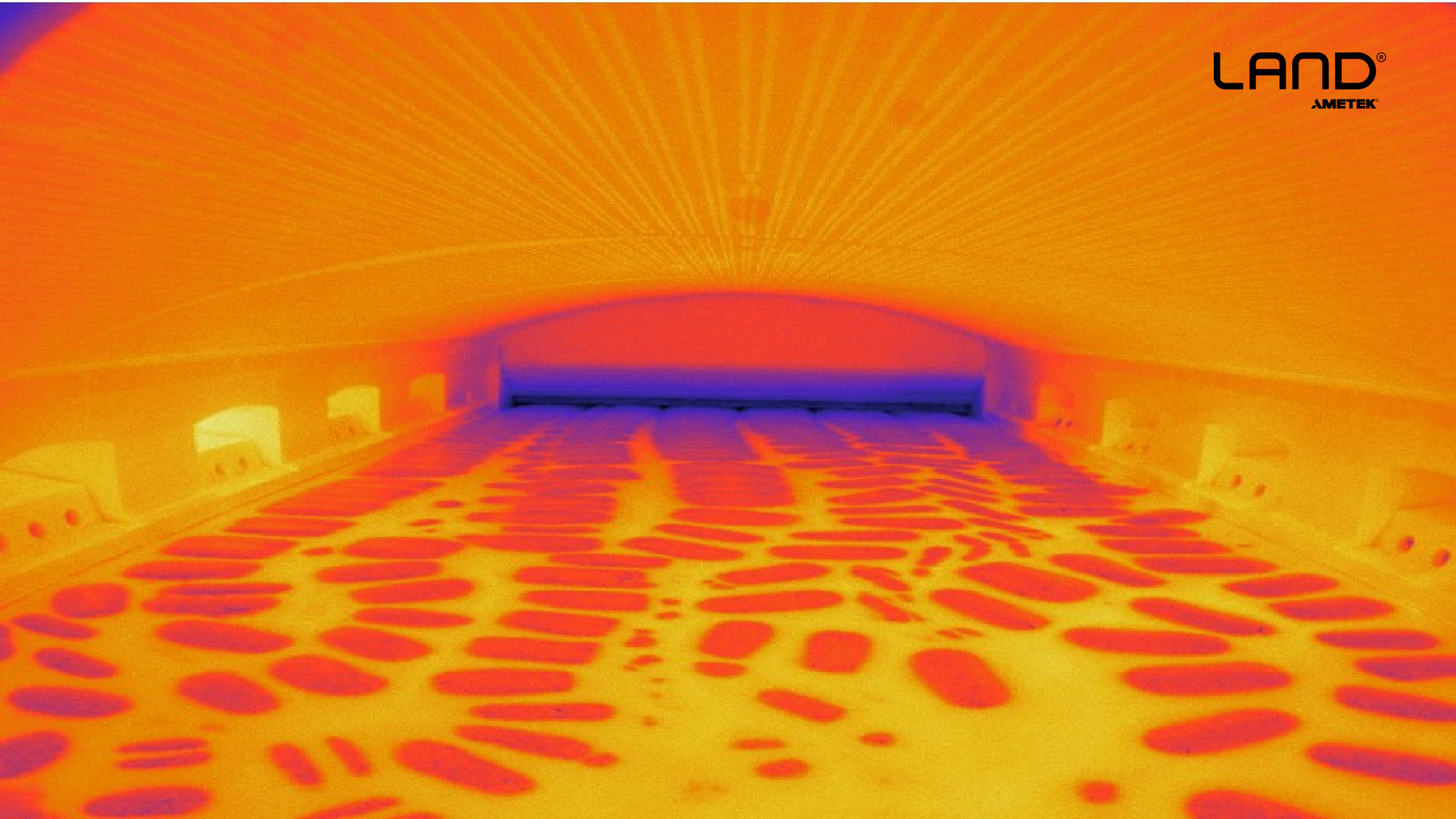
NIR-B (GLASS)
656x494 Pix = **324.064 PIXEL**

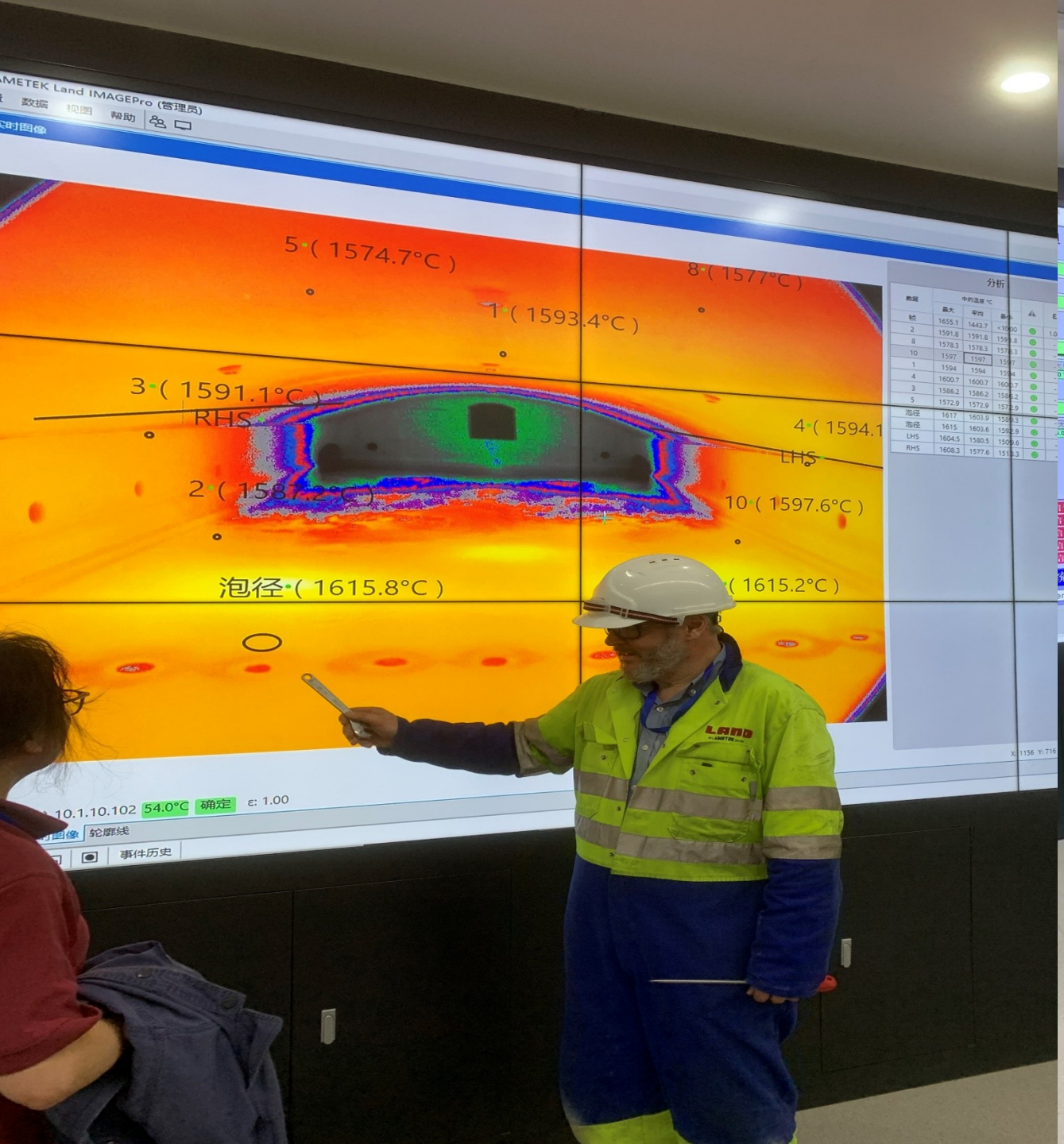


x10

NIR-B-2K-95 (GLASS)
2000x1500 Pix = **3 MIO PIXEL**



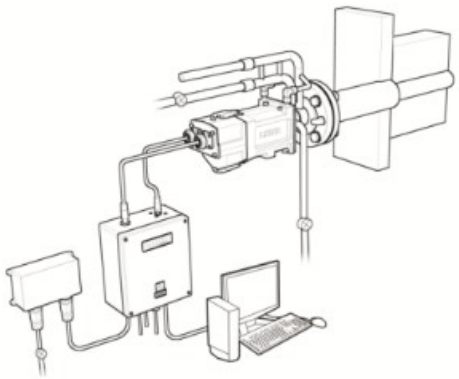

LAND®
AMETEK


AMETEK Land IMAGEPro (管理员)
数据
视图
帮助
实时图像
5 (1574.7°C)
8 (1577°C)
1 (1593.4°C)
3 (1591.1°C)
RHS
4 (1594.1
LHS
2 (1587.2°C)
10 (1597.6°C)
泡径 (1615.8°C)
(1615.2°C)
分析
10.1.10.102
54.0°C
确定
ε: 1.00
轮廓线
事件历史


LAND
AMETEK
5 (1579.5°C)
1 (1589.1°C)
3 (1588.4°C)
RHS
4 (1597.6
LHS
10 (1596.4°C)
泡径 (1617.5°C)

NIR-b-2K GLASS - 3 x possibilities

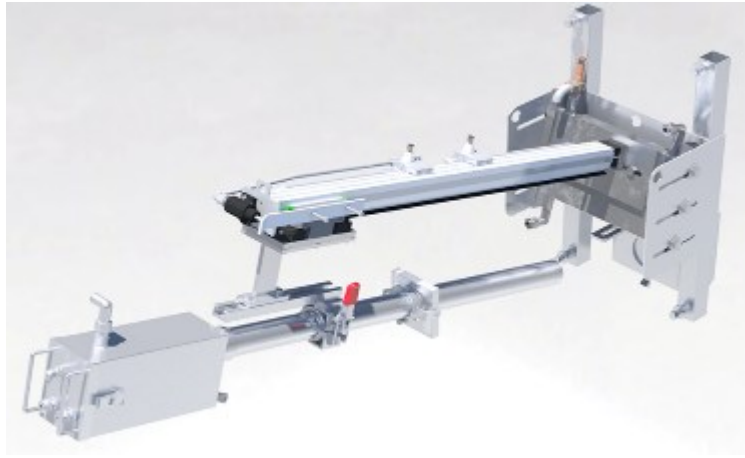
- NIR-b-GLASS-90-18-3-25 (50) –NR
- Stand alone version



- **NIR-b-2K-1000/1800C-95/3-25-LPARW-GLASS** Complete with Pneumatic auto retraction system – fixed Centerline location

* Recommended where airline pressure is below 6 bar.

NIR-b-GLASS-90-18-3-25-PAR
Complete with Pneumatic auto retraction system – fixed Centerline location



* Recommended for higher Ambient Temperatures

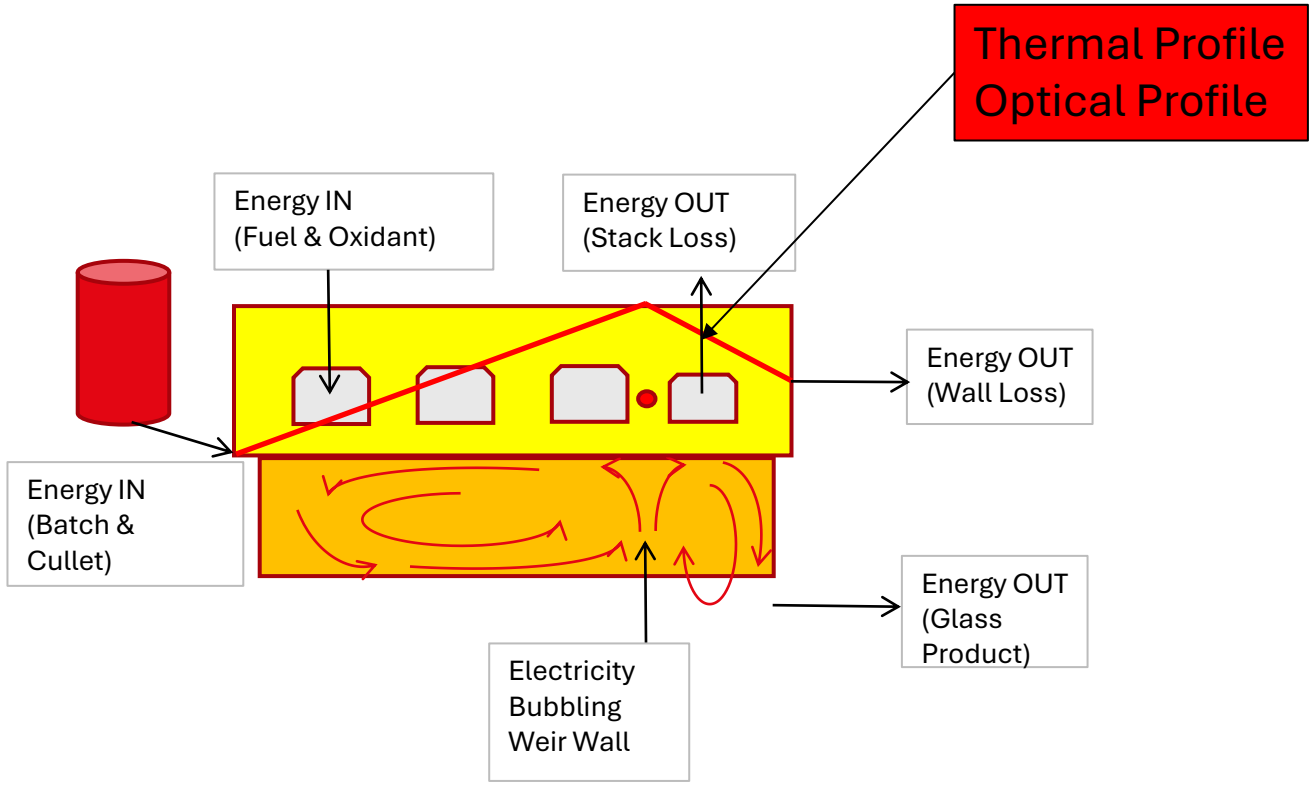
New LPAR EXTRACT

LAND®
AMETEK

The benefits in furnace operations
“Not just a pretty image”

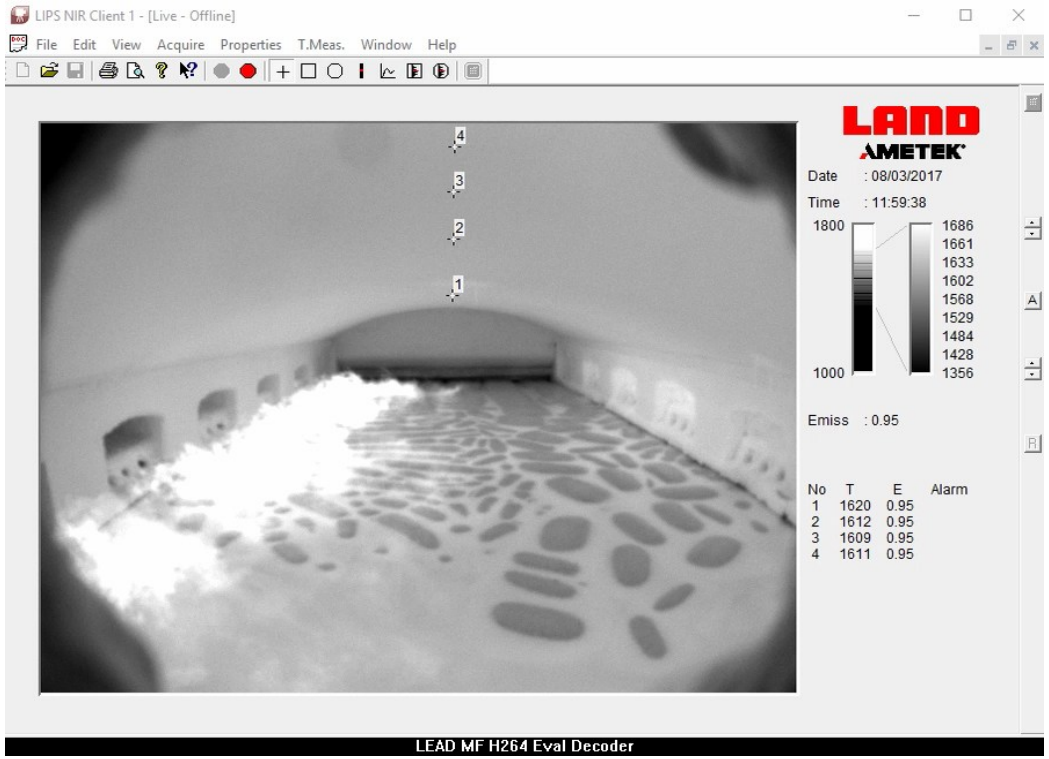
Primary goals of melting => Energy & Emission

- Maintain Temperature Profile for Good Glass
- Use materials that are easier to melt
- Optimise wall losses (insulate) or increase pull to reduce%
- Reduce Stack losses through heat recovery
- Optimise Combustion and Heat Transfer
  - Note: Glass furnaces do not use PID control- typically manual

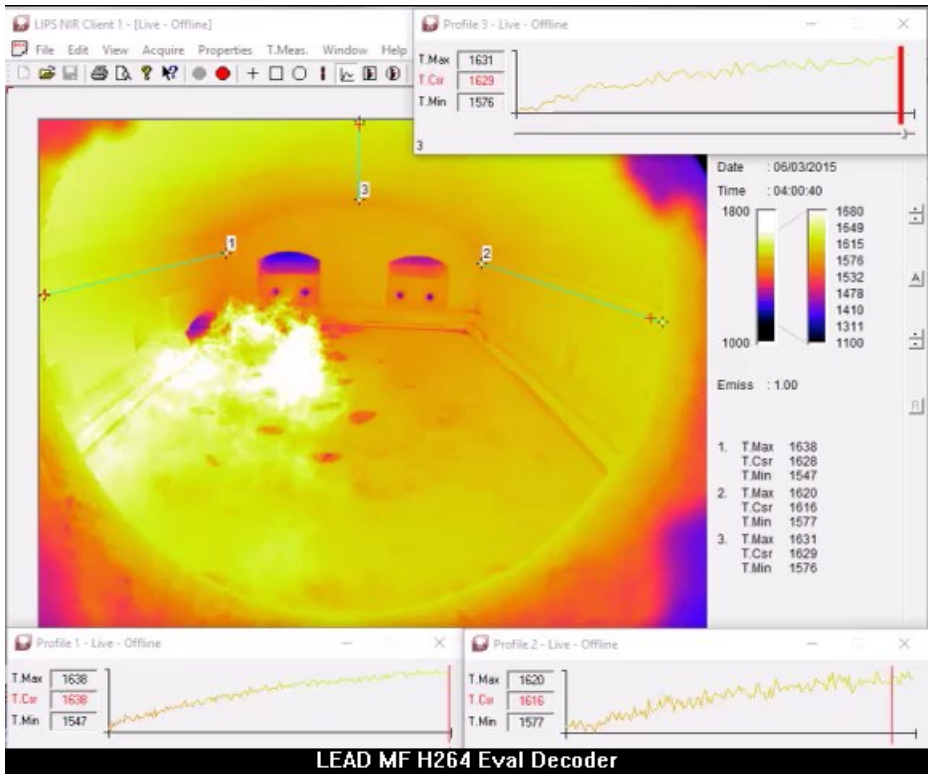


Remember the four pillars of benefits with thermal imaging NIR-b! This is not only a pretty image!

Thermocouple Verification



Optical-Thermal profiles with hot spots

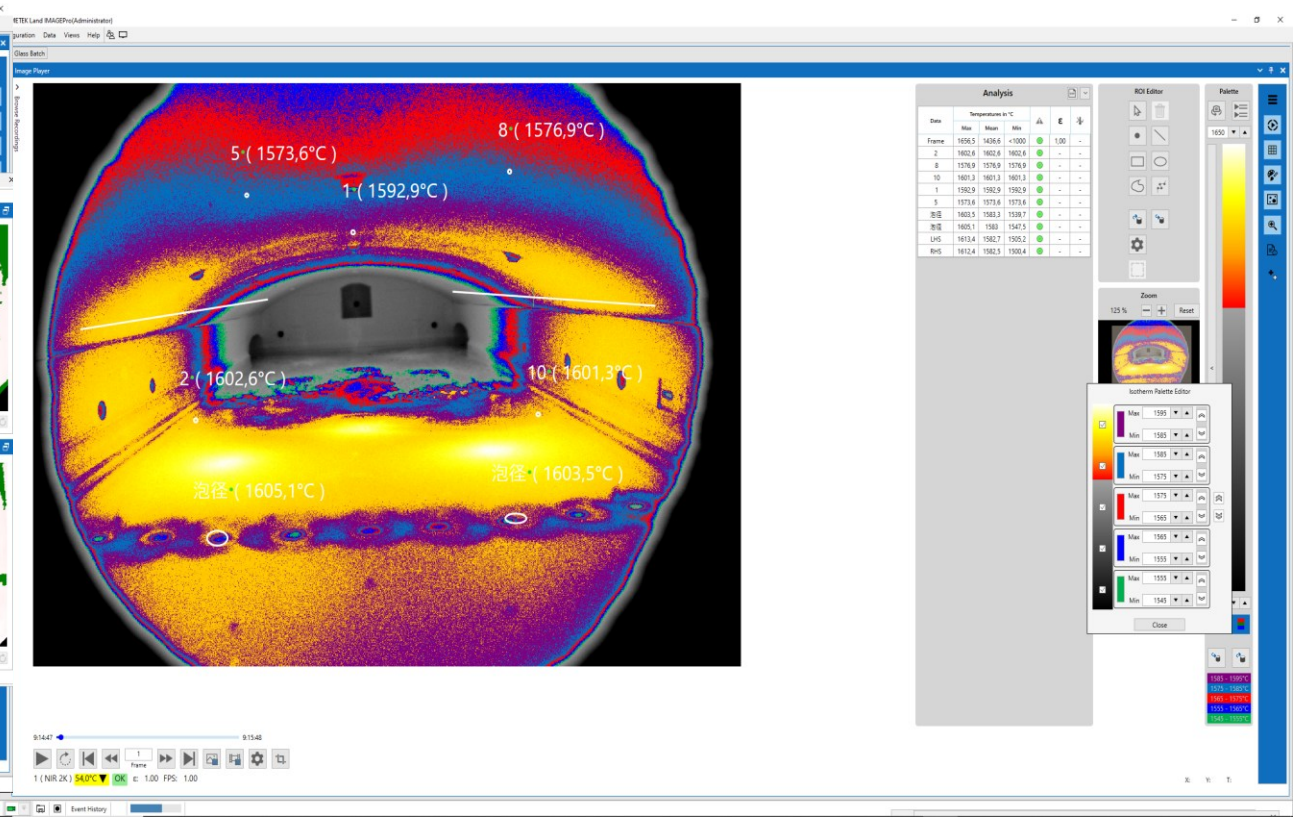


See degrees differently.

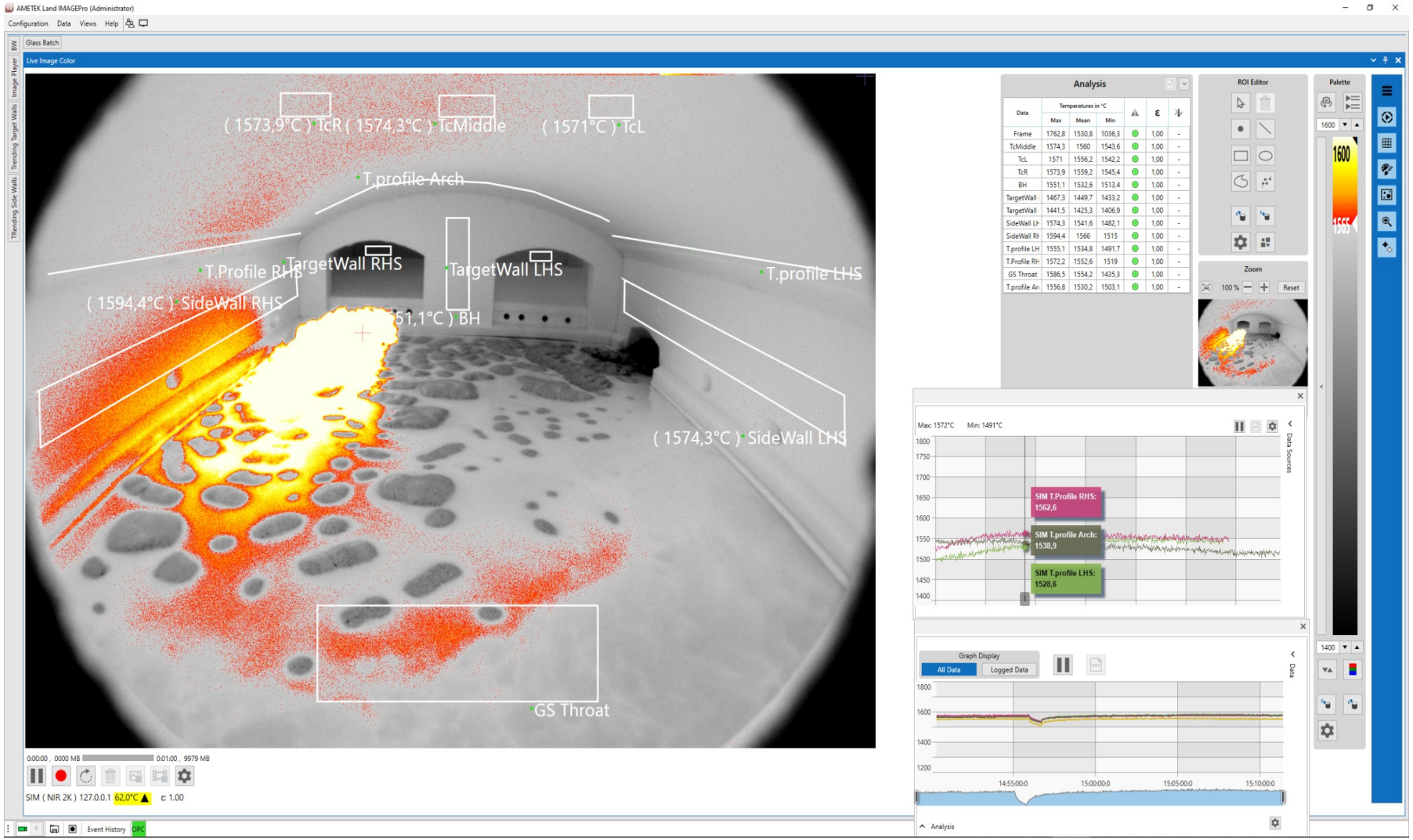
Remember the four pillars of benefits with thermal imaging NIR-b! This is not only a pretty image!

BW Palette for Air ingress and Batch pattern

Rainbow Isotherms with 5 bands for hot and cold spot locations



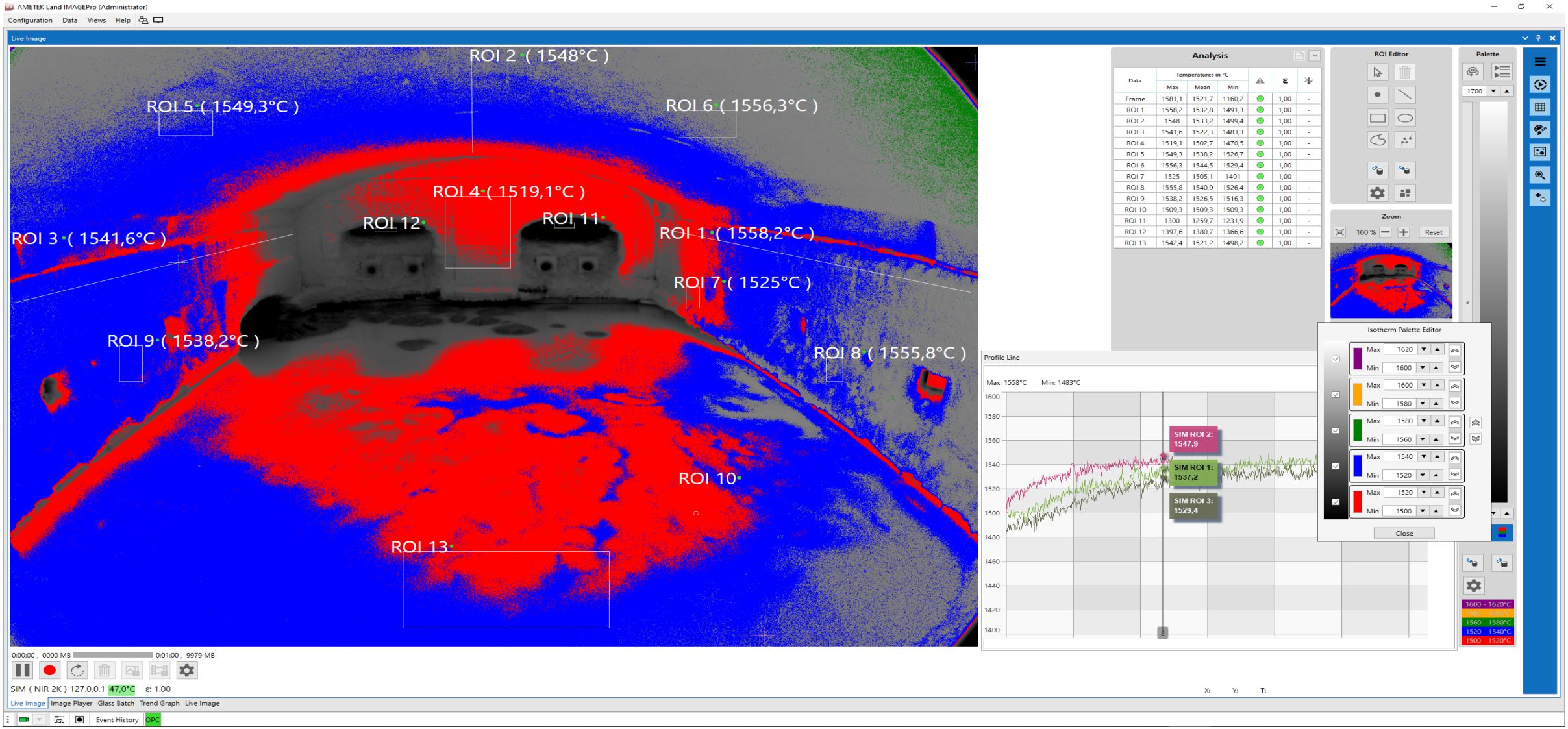
Flame shape and intensity – mono / rainbow / integrator



- Highlights flame shape and areas of high intensity for combustion and emissions optimisation
- Continuous real time Temperature data.
- Areas used to monitor Highest or Average or Lowest Temperature.
- Crown, Regenerator and Side Wall temperature monitoring.

See degrees differently.

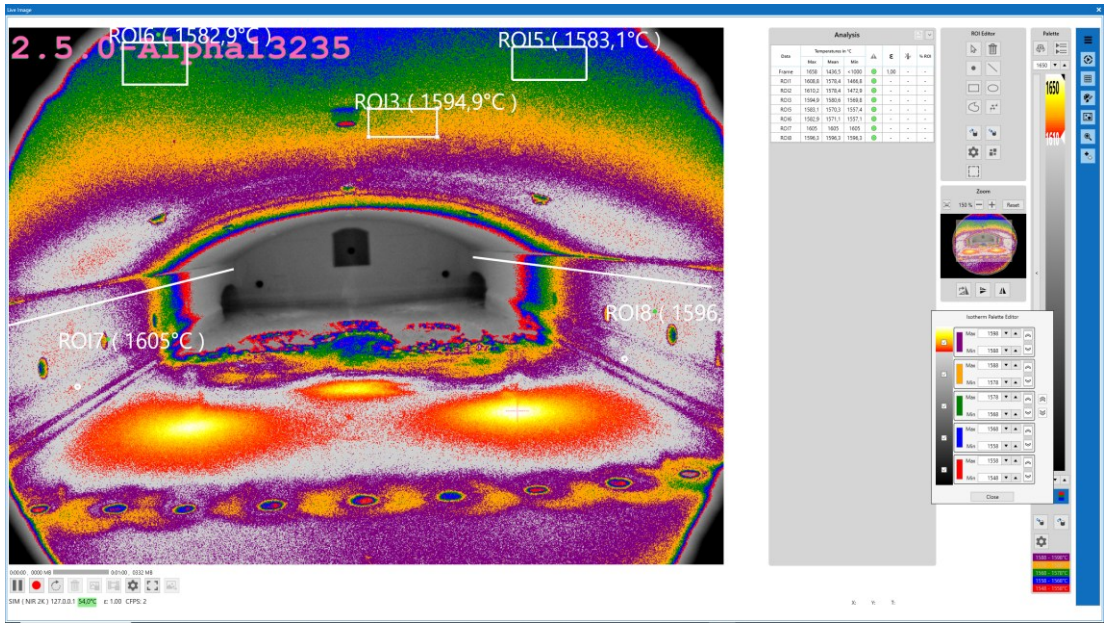
Isotherms


AMETEK Land IMAGEPro (Administrator)
Configuration Data Views Help
Live Image
ROI 2 (1548°C)
ROI 5 (1549,3°C)
ROI 6 (1556,3°C)
ROI 4 (1519,1°C)
ROI 12
ROI 11
ROI 3 (1541,6°C)
ROI 1 (1558,2°C)
ROI 7 (1525°C)
ROI 9 (1538,2°C)
ROI 8 (1555,8°C)
ROI 10
ROI 13
Analysis
Data
Temperatures in °C
Max Mean Min
Frame 1581,1 1521,7 1160,2 1,00
ROI 1 1558,2 1532,8 1491,3 1,00
ROI 2 1548 1533,2 1499,4 1,00
ROI 3 1541,6 1522,3 1483,3 1,00
ROI 4 1519,1 1502,7 1470,5 1,00
ROI 5 1549,3 1538,2 1526,7 1,00
ROI 6 1556,3 1544,5 1529,4 1,00
ROI 7 1525 1505,1 1491 1,00
ROI 8 1555,8 1540,9 1526,4 1,00
ROI 9 1538,2 1526,5 1516,3 1,00
ROI 10 1509,3 1509,3 1509,3 1,00
ROI 11 1300 1259,7 1231,9 1,00
ROI 12 1397,6 1380,7 1366,6 1,00
ROI 13 1542,4 1521,2 1498,2 1,00
ROI Editor
Zoom
100 %
Reset
Palette
1700
Profile Line
Max: 1558°C Min: 1483°C
SIM ROI 2: 1547,9
SIM ROI 1: 1537,2
SIM ROI 3: 1529,4
Isotherm Palette Editor
Max 1620 Min 1600
Max 1600 Min 1580
Max 1580 Min 1560
Max 1540 Min 1520
Max 1520 Min 1500
Close
1600 - 1620°C
1580 - 1600°C
1560 - 1580°C
1520 - 1540°C
1500 - 1520°C
0:00:00 , 0000 MB 0:01:00 , 9979 MB
SIM (NIR 2K) 127.0.0.1 47,0°C ε: 1.00
Live Image Image Player Glass Batch Trend Graph Live Image
Event History OPC

NIR-b-2K and oxygas furnaces

Benefits of NIR-b-2K on Oxygas or Hybrid furnaces

- Batch line location in conjunction of thermal profiling and isotherms
- Burners block cleaning and overheating
- Isotherms with hot spots and cold spots
- Burner Block inspection where possible
- Flame impacts on refractories
- Identify areas of concern and recommendations for further investigation



NIR-b-2K – Survey Mode

Heat-Up and Cool-Down processes
Flames optimisation

Benefits of NIR-b-2K – Survey Mode with Amecare

Full survey kit in Storm case

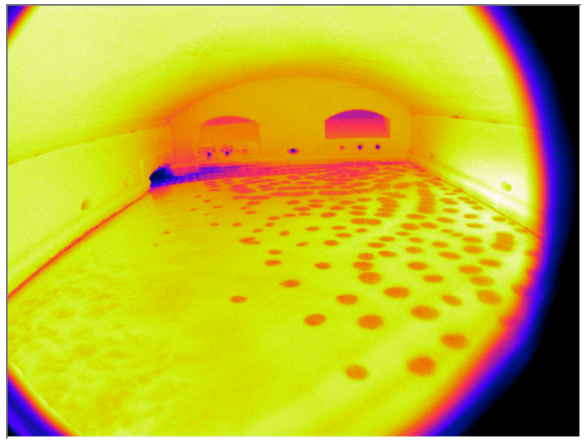
NIR-b-2k camera, 2ft probe, range 1000-1800C.

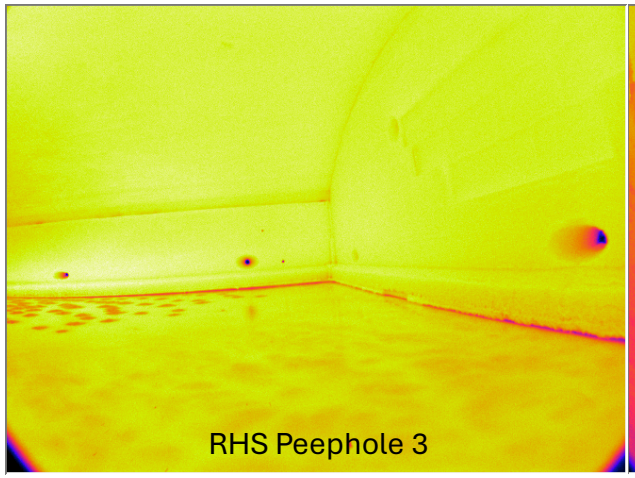
2ft Water Cooled Jacket

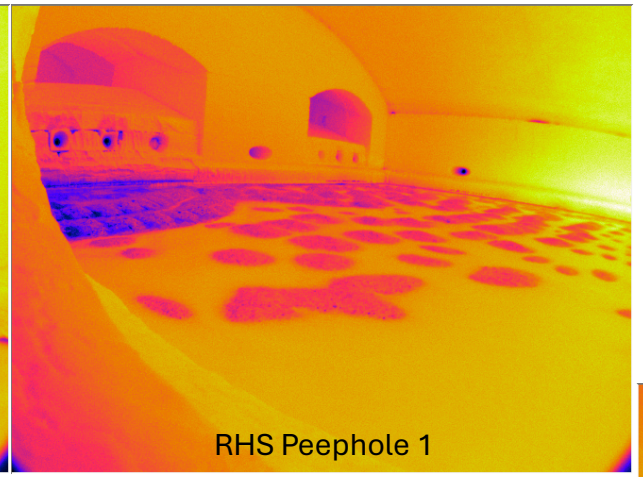
25m Power and Ethernet cables.

Thermal Images – Survey Mode

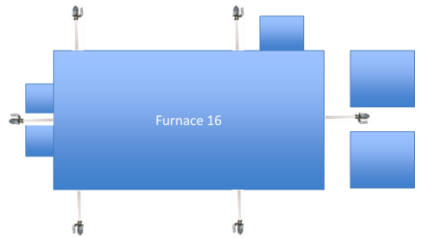
Centre above throat
Existing CCTV location

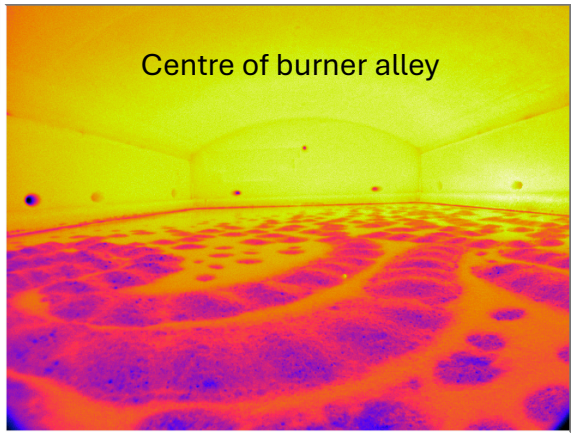


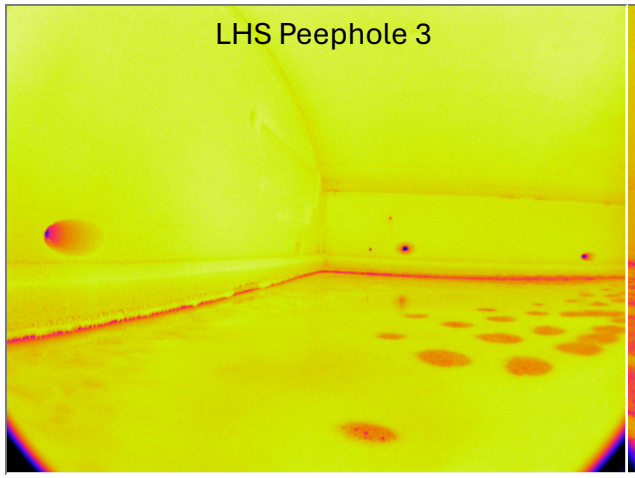


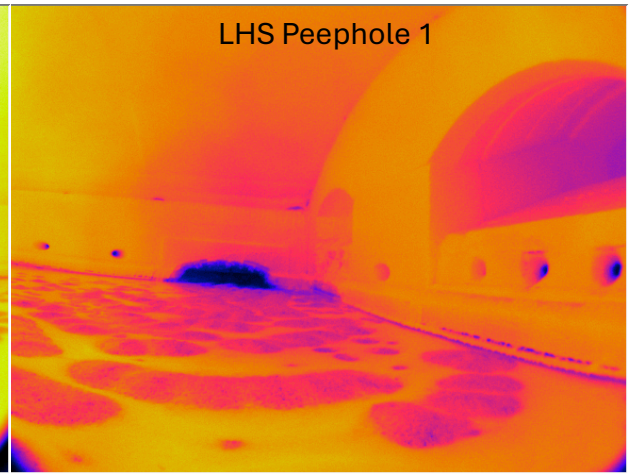


Right Hand Side









Left Hand Side

Image Player

Browse Recordings

16:12:04 16:12:04

427 Frame

Camera1 (NIR 2K) 51,0°C OK 32 ε: 1.00 FPS: 1.00

X: Y: T:

Analysis

Data	Temperatures in °C				ε	
	Max	Mean	Min			
Frame	1642,5	1522	<1000		1,00	-

ROI Editor

Zoom

100 % Reset

File Details

Camera Type: NIR 2K

File Name: Four 4 Peep hole 1 RHS to LHS Flames 2022-12-08-16-04-57_Camera1.erfx

Isotherm Palette Editor

	Max	Min
	1640	1590
	1590	1565
	1550	1525
	1525	1500
	1500	1475

Close

Palette

1680

1680

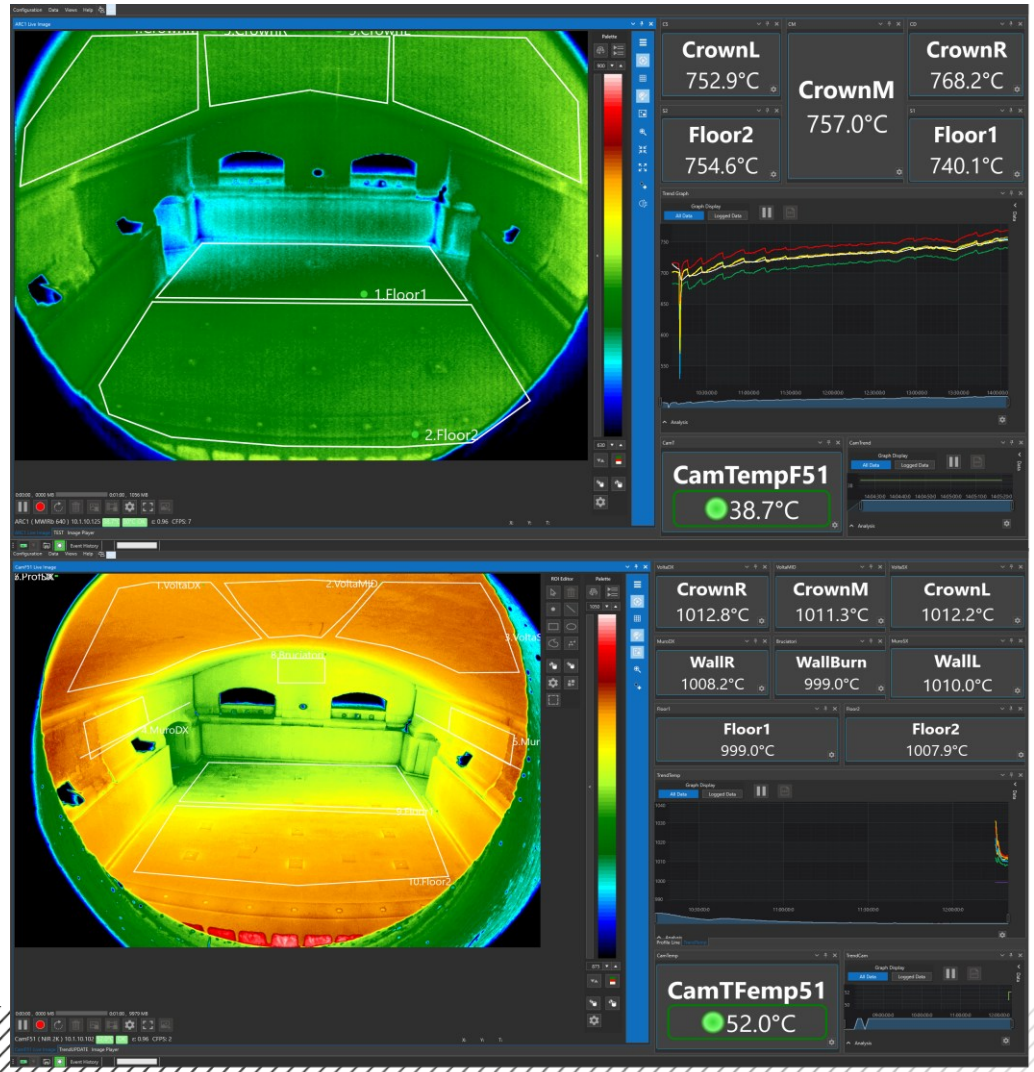
1603

1590 - 1640°C

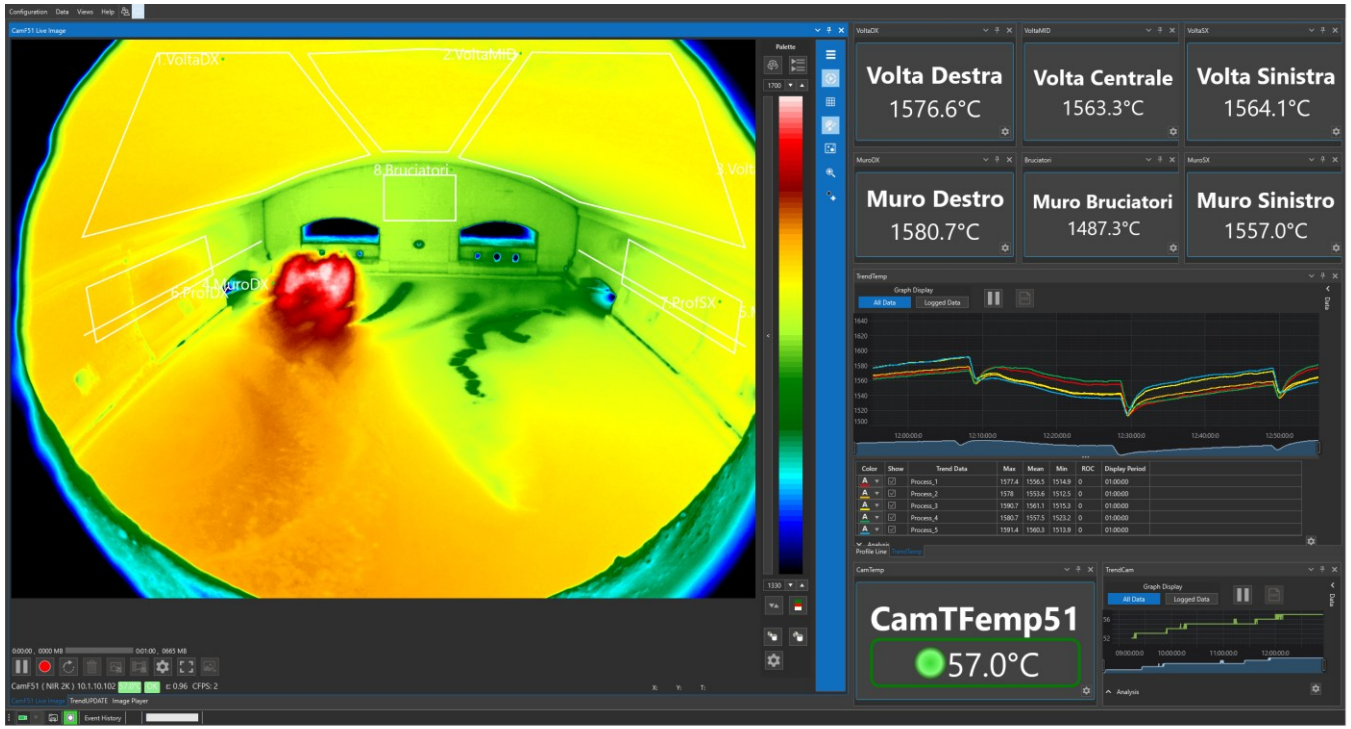
1565 - 1590°C

Heat-up with bundle based on LWIR-640, MWIR-b and NIR-b cameras

Heat-up phase from 100°C to 1000°C



Charging phase with NIR-b-2K



See degrees differently.

Batch coverage and crown temperature with ImagePro V2
GLASS with AI batch coverage based on neural networks

Introduction

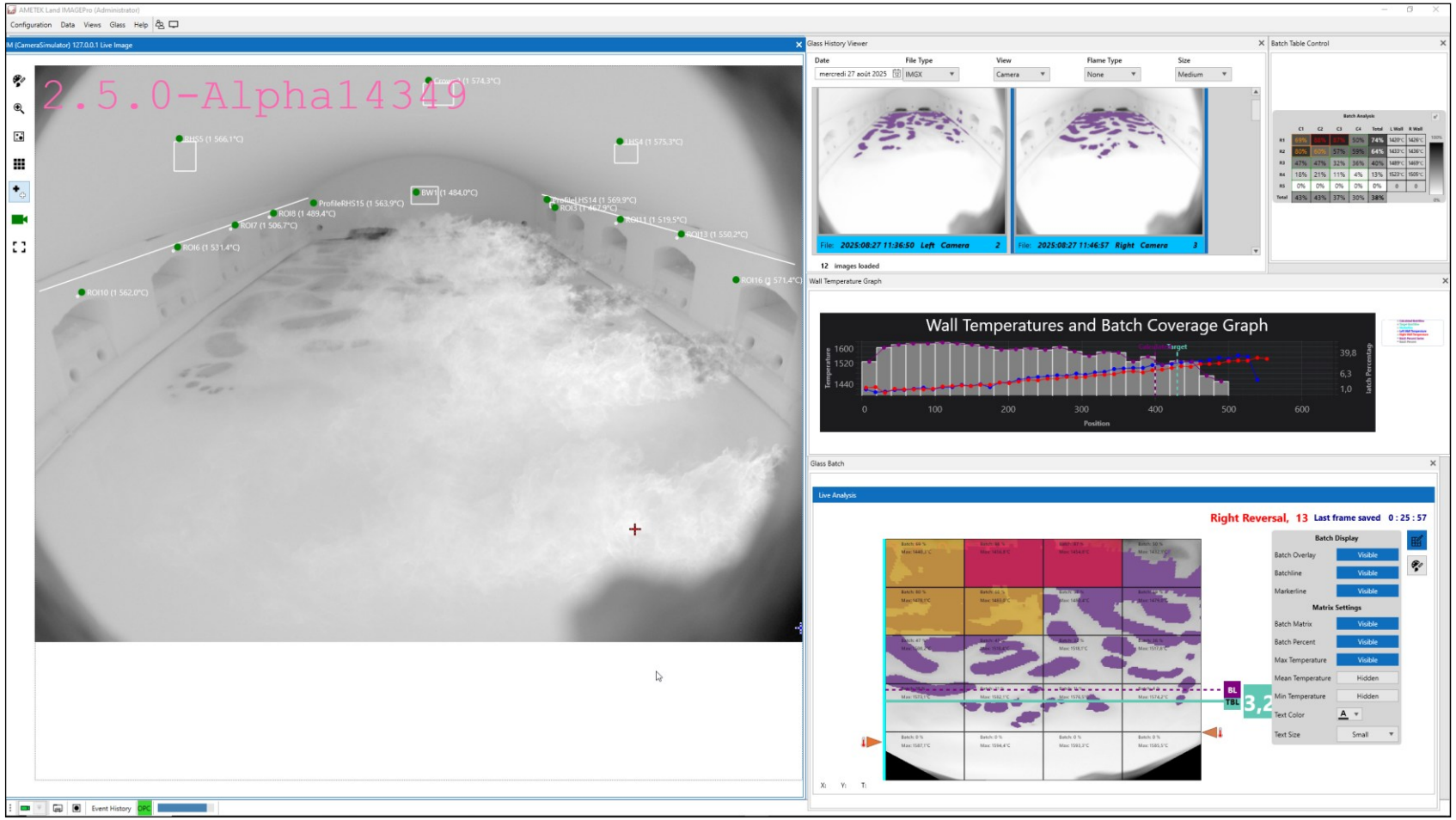
- Tracking batch in a glass furnace is challenging due to environmental obstacles especially for regenerative cross fired and large float furnaces.
- Machine learning can improve accuracy over traditional threshold-based methods whatever the furnace technologies.
- This study explores and proposes the use of neural networks for batch tracking and batch line determination.

Top Down 2D view of Batch coverage - The Grid with Neural Network

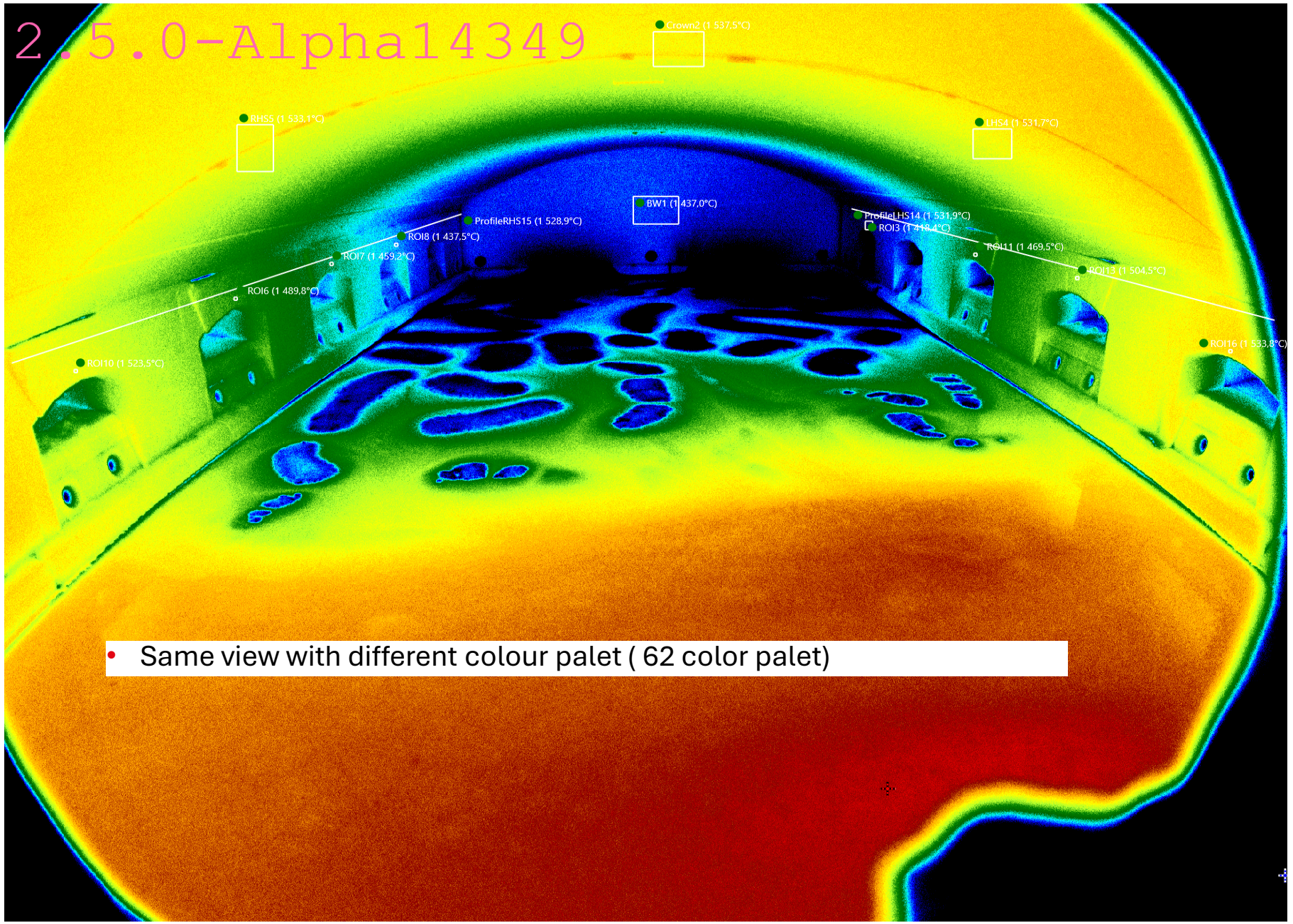
- Introduction to neural network in next ImagePro software
  - Advancements in deep learning allow for improved batch tracking
  - This is based a modified U-Net architecture - Based Model for Batch Tracking developed by LAND based on Semantic Segmentation networks
  - Provide pixel-level classification
  - Multiple category segmentation with single pass (convolutional Encoder-decoder structure) making them more effective.

New Interface with IPV2 glass module

- Improved main Camera Field of Views with multiple color palets including orange palet for flames heat transfer
- Improved ROIs interface with scalable values and figures
- New possible interface with AI batch grid
- Glass History Viewer
- Wall Temperature vs Batch coverage graph
- Batch table control



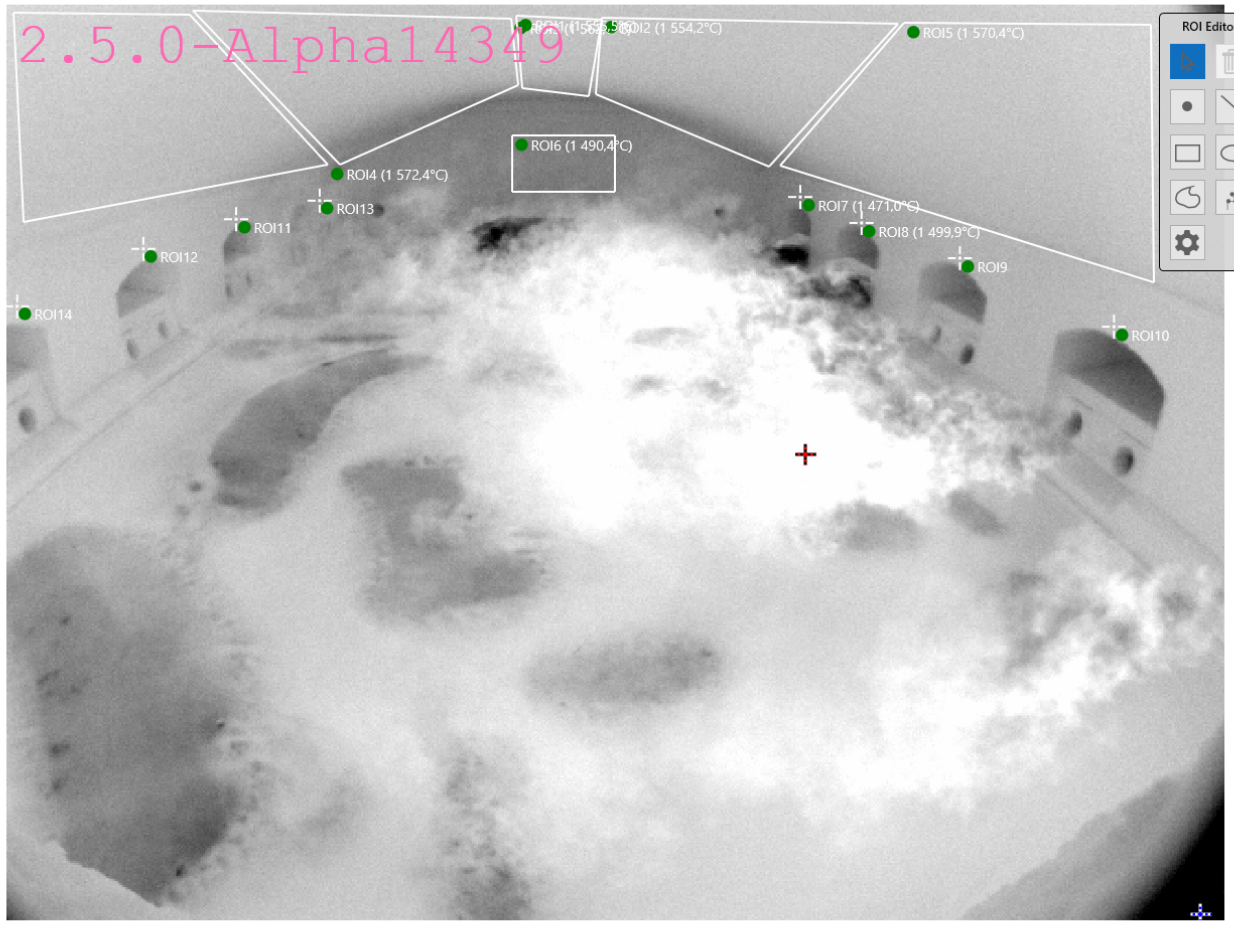
See degrees differently.


SIM (CameraSimulator) 127.0.0.1 Live Image
2.5.0-Alpha14349
Crown2 (1 537,5°C)
RHS5 (1 533,1°C)
LHS4 (1 531,7°C)
BW1 (1 437,0°C)
ProfileRHS15 (1 528,9°C)
ROI8 (1 437,5°C)
ROI7 (1 459,2°C)
ROI6 (1 489,8°C)
ROI10 (1 523,5°C)
ProfileLHS14 (1 531,9°C)
ROI3 (1 419,4°C)
ROI11 (1 469,5°C)
ROI13 (1 504,5°C)
ROI16 (1 533,8°C)
100 %
0 °
ROI Editor
1600
1550
1500
1450
1400
• Same view with different colour palet (62 color palet)

AMETEK Land IMAGEPro (Administrator)

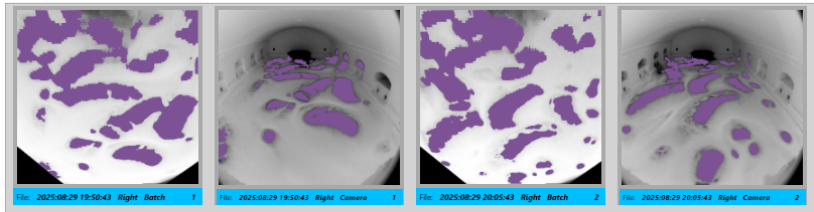
Configuration Data Views Glass Help

SIM (CameraSimulator) 127.0.0.1 Live Image

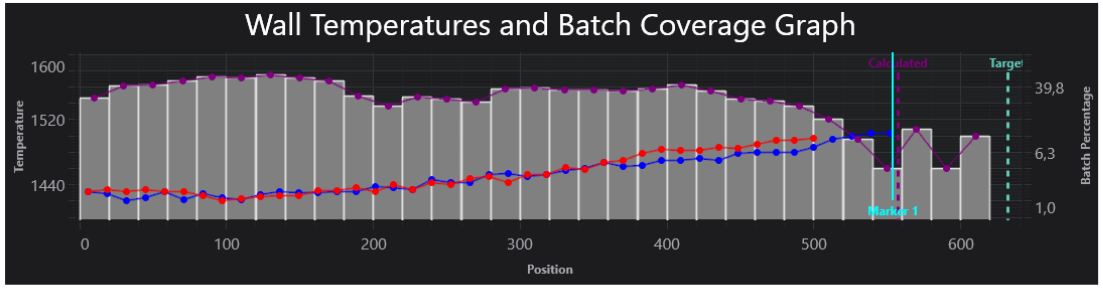


Glass History Viewer

Date: vendredi 29 août 2025 | File Type: IMGX | View: Both | Flame Type: None



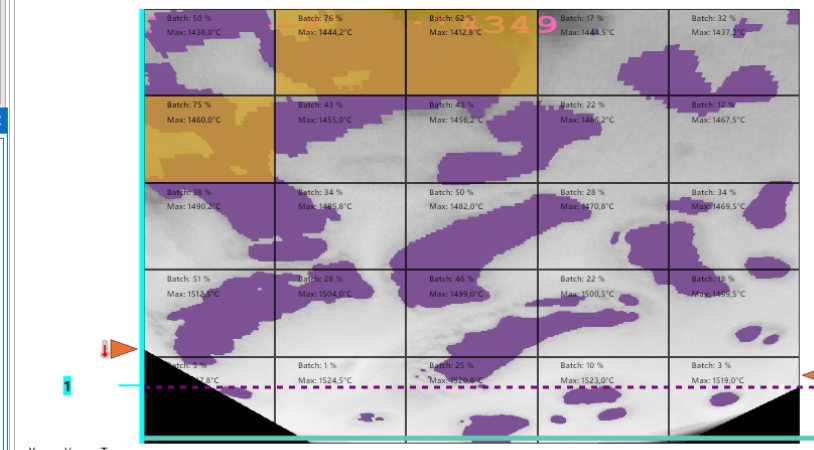
Wall Temperature Graph



Glass Batch

Live Analysis

Right Reversal, 2 Last frame saved 0 : 08 : 25



Batch Display

Batch Overlay	Visible
Batchline	Visible
Markerline	Visible

Matrix Settings

Batch Matrix	Visible
Batch Percent	Visible
Max Temperature	Visible
Mean Temperature	Hidden
Min Temperature	Hidden
Text Color	A
Text Size	Small

SIM ROI Analysis View

Analysis

Name	Max	Mean	Min	Alarms	Emissivity	Background
Frame	1665	1538,4	1242,7		0,95	-
ROI1	1555,5	1532,8	1465,7		-	-
ROI2	1554,2	1527,3	1444,9		-	-
ROI3	1562,6	1529,3	1453,6		-	-
ROI4	1572,4	1543,9	1483,6		-	-
ROI5	1570,4	1540	1465,8		-	-
ROI6	1490,4	1474,7	1458		-	-
ROI7	1471	1471	1471		-	-
ROI8	1499,9	1499,9	1499,9		-	-
ROI9	1526,2	1526,2	1526,2		-	-
ROI10	1529,4	1529,4	1529,4		-	-

Why to use NIR-b-2K on glass furnaces? Extended benefits

- The Grid with Neural networks improve batch tracking over traditional threshold-based methods. Available in Q4 2025.
- Better accuracy for batch detection based on Neural existing model.
- Use of SCADA possible to share values of the Grid to get batch line location
- Possible Thermal Surveys with transportable NIR-b combining bundles Gas Analyser and Cyclops C100L
- Combustion optimisation for energy reduction
- Digitalisation with thermal distribution, bird eyes pictures and Glass History Viewer – Modbus or OPC UA server
- Predictive software or SCADA – EU References
- Traceability and Data for quality management
- Extended life of assets and improved daily furnace operations

- The simple way to support the operation team to optimise and balance any Furnace

Thermal Imaging Systems For Continuous Monitoring In Different Furnace And Boiler Applications – Examples

NIR-B-656

Standard resolution (656 x 494 pixels) gives over 300 thousand temperature points.

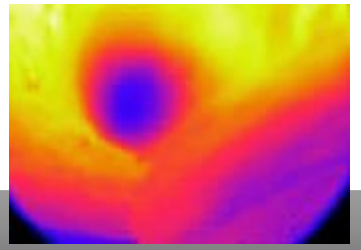
Image Pixels:	656 x 494
Measurement Ranges:	600 to 1000 °C / 1112 to 1832 °F 800 to 1400 °C / 1472 to 2552 °F 1000 to 1800 °C / 1832 to 3272 °F
Field of View (Horizontal x Vertical):	90° x 67.5°, 44° x 33°
Glass Melt Tank Model - **NIR-B-656-GLASS** (please refer to NIR-B-GLASS Brochure)	1000 to 1800 °C / 1832 to 3272 °F 90° x 67.5°

TYPICAL APPLICATIONS

Reheat Furnace	Glass Melt Tanks
Reformer Tube Furnaces	Cement Kilns
Coal Fired Power Boilers	Biomass Boilers

Example:
Cement Furnaces (rotary kilns) or boilers

Medium & Small Furnaces



NIR-B-2K

High resolution (1968 x 1472 pixels) gives nearly 3 million temperature points.

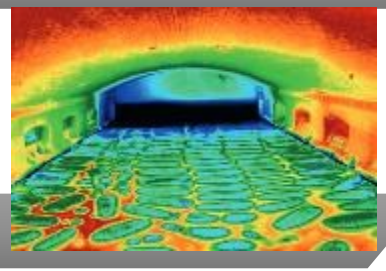
Image Pixels:	1968 x 1472
Measurement Ranges:	600 to 1000 °C / 1112 to 1832 °F 800 to 1400 °C / 1472 to 2552 °F 1000 to 1800 °C / 1832 to 3272 °F
Field of View (Horizontal x Vertical):	95° x 71°
Glass Melt Tank Model - **NIR-B-2K-GLASS** (please refer to NIR-B-GLASS Brochure)	1000 to 1800 °C / 1832 to 3272 °F 95° x 71°

TYPICAL APPLICATIONS

Reheat Furnace	Glass Melt Tanks
Reformer Tube Furnaces	Cement Kilns
Coal Fired Power Boilers	Continuous Casting

Example:
Glass Melt Tanks

Large Furnaces



NIR-B-640

Wide dynamic range imaging technology for furnace applications where a wider temperature measurement range is required from a single imager.

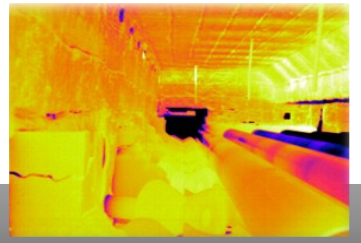
Image Pixels:	640 x 480
Measurement Range:	600 to 2000 °C / 1112 to 3632 °F
Field of View (Horizontal x Vertical):	90° x 67.5°

TYPICAL APPLICATIONS

Cement Kiln	Cement Cyclone Furnace
Reheat Furnace	Continuous Casting (zone 1)
Heat Treatment Furnace	Annealing Furnace

Example:
Reheat Furnaces

Heat & Reheat Furnaces



NIR-B-3XR

Hazardous area compliant to ATEX, IECEx and CSA. Wide dynamic range imaging technology for furnace applications where a wider temperature measurement range is required from a single imager.

Image Pixels:	640 x 480
Measurement Range:	600 to 1800 °C / 1112 to 3272 °F
Field of View (Horizontal x Vertical):	90° x 67.5°

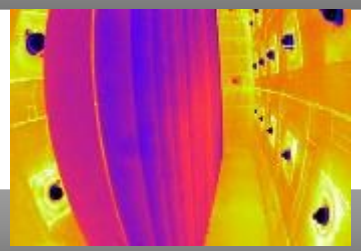
Hazardous Area Certification: EX NIR-B WG1: Ex nA IIC T4 Gc Tamb=-20 °C to +55 °C (ATEX certificate: CML 15ATEX4086X / IECEx certificate: IECEx CML 15.0042X) EX NIR-B WG2: Class I, Division 2, Groups A, B, C, D; T4 Tamb=-20 °C to +60 °C (CSA certificate for US and Canada: 70080206)

TYPICAL APPLICATIONS

Hydrogen Reformer	Ammonia Production
Ethylene Cracking Furnaces	Methanol Production
Syngas Production	

Example:
Tube Furnaces (Reformers & Crackers)

Tube Furnaces (HPI)



See degrees differently.

Philippe Kerbois
Global Industry Manager
philippe.kerbois@ametek.com

+33 (0) 6.75.38.39.87

See degrees differently.