

CASE STUDY

BORESCOPE INCREASES KNOW-HOW BY CONTINUOUSLY MEASURING TEMPERATURE OF TUBE WALLS FOR AIR LIQUIDE

INTRODUCTION

Air Liquide, the world leader in gases, technologies and services for industry and health, has implemented AMETEK Land's Near Infrared Borescope (NIR-B) 3XR, an enhanced thermal imager, and now is gaining in know-how by continuously measuring temperature of tube walls within its steam methane reformers (SMR).

ABOUT AIR LIQUIDE

Founded in 1902, Air Liquide group supplies industrial gases and related services to customers in a range of industries, including oil and gas, chemicals, metals, construction, food and beverage, research and analysis, electronics and healthcare among others. It is present in 80 countries with approximately 67,000 employees and serves more than 3 million customers and patients.

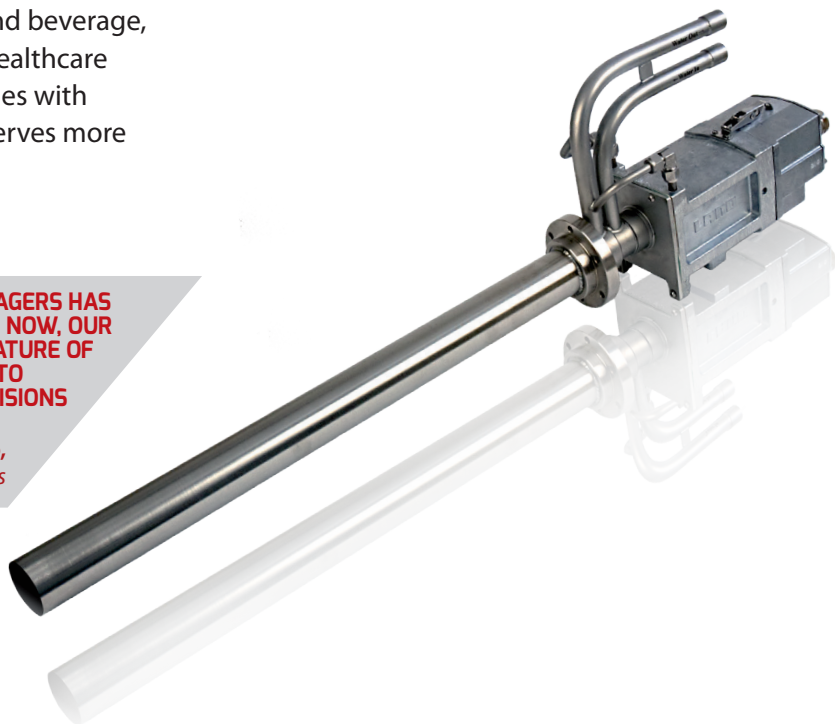
THE CHALLENGE

Air Liquide's steam methane reformers, producing hydrogen and carbon dioxide industrial gases, are critical assets and their operation, safety and reliability, are of paramount importance, however they are very challenging assets to maintain and operate. Some of the common problems in reformer operation are burner, flue gas distribution and catalyst issues. All of these problems can directly affect Tube Wall Temperatures (TWT), tube life and lead to premature tube failure. They can also lead a producer being overly cautious on TWT and losing valuable production every year.

"THE IMPLEMENTATION OF THE THERMAL IMAGERS HAS ALLOWED US TO GAIN FURNACE KNOW-HOW. NOW, OUR TEAMS ARE ABLE TO MONITOR THE TEMPERATURE OF THE TUBES CONTINUOUSLY, THEY ARE ABLE TO MAKE MORE INFORMED AND CONFIDENT DECISIONS IMPLYING GREATER PLANT RELIABILITY."

Gonzalo Navarro,

Production Manager at Air Liquide Ibérica de Gases



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NIR-B 3XR

Near Infrared Process Imaging
For the Industrial Gas Industry
600 to 1800 °C / 1112 to 3272 °F

Using AMETEK Land's Cyclops, a portable non-contact pyrometer, TWT readings are taken manually through peep doors. These measurements are spot readings. When opening peep doors, tubes cool, affecting the accuracy of temperature measurement, plus enormous stress is added to the tubes resulting in potential damage to the tube wall.

Air Liquide understands the critical importance of managing TWT and required a solution to deliver highly accurate and more complete measurement of the equipment and process, compared to spot temperature measurements, whilst operating in a hazardous environment. AMETEK Land recommended its Near Infrared Borescope (NIR-B) 3XR, which provides a high resolution thermal image with real time high accuracy temperature measurements of both the tube wall and

refractory wall surface, allowing for background compensation.

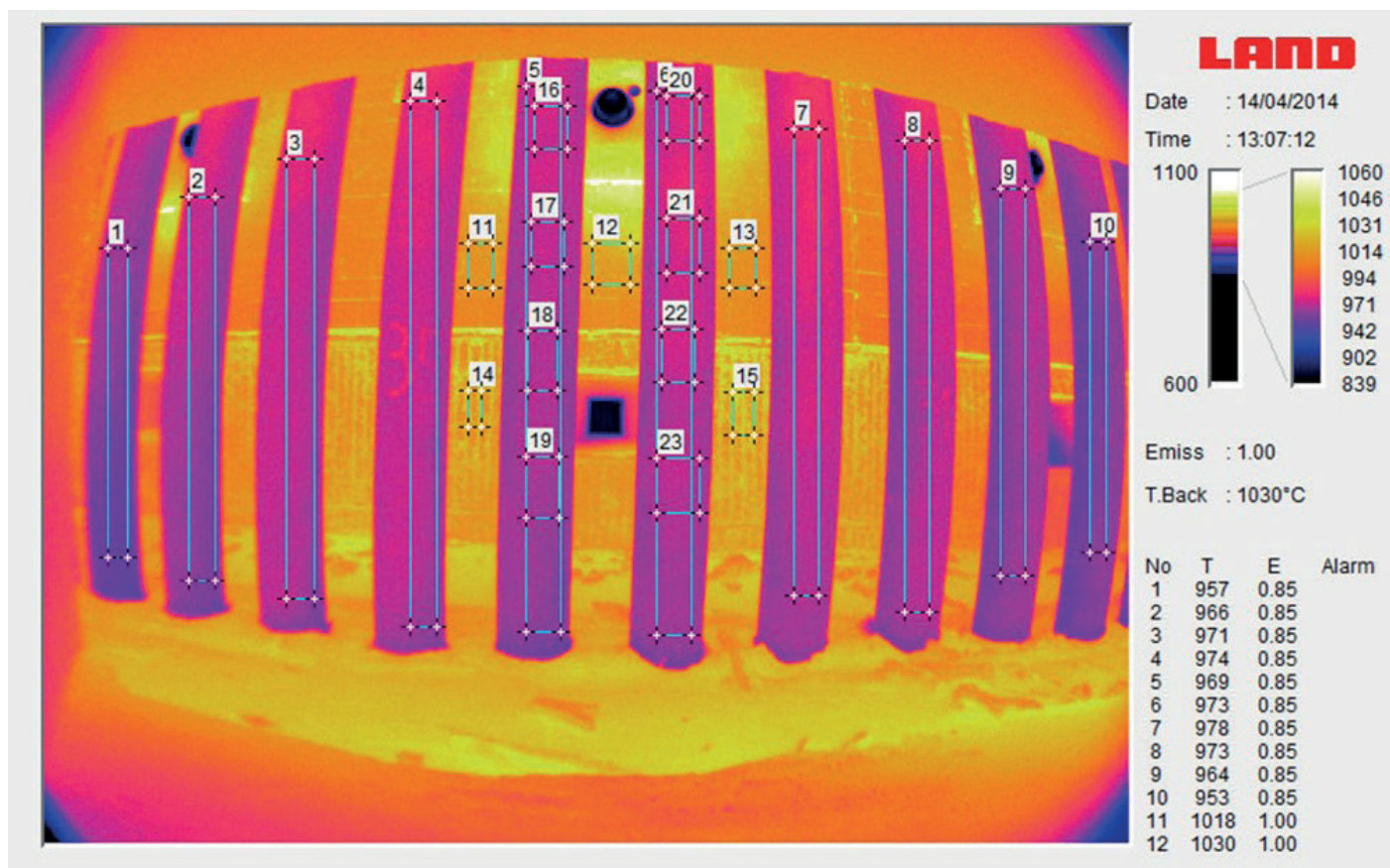
THE SOLUTION

Developed specifically to operate in the hazardous area of a steam methane reformer, the NIR-B 3XR is ATEX and IECEx approved and CSA certified. The NIR Borescope (NIR-B) 3XR is a short wavelength radiometric infrared borescope imaging camera, which measures temperatures in the single range 600 to 1800 °C (1112 to 3272 °F) and utilizes the latest wide dynamic range imaging technology. This is ideal for Air Liquide's industrial gas application where there exist high differential temperatures in the field of view such as tube and furnace walls.

Air Liquide initially undertook a live trial of AMETEK Land's NIR-B at one pilot plant with the full support of AMETEK Land's team in Spain, which enabled the operators to fully test the instrument within their



NIR-B 3XR inserted through the steam methane reformer wall.



NIR-B 3XR thermal image of tubes within steam methane reformer.

specific and harsh environment. Air Liquide confirmed the instrument's suitability and proved the critical role it could play in enabling and enhancing tube know-how. The borescope is installed through the furnace wall in front of the tubes within the chamber. Via a field connection box, the thermal imager is connected to the control room.

OUTCOME

Gonzalo Navarro, Production Manager at Air Liquide Ibérica de Gases comments "Our main drivers in investing in AMETEK Land's NIR-B 3XR are to extend tube and catalyst life, which we are achieving as a result. We are continuously learning about our reformer which enables us to balance it correctly and follow online our main and critical asset.

Air Liquide use the extensive functions available within the LIPS NIR-B thermal imaging software to monitor TWT 24/7 and receive early warning of increasing temperature. Mr Navarro comments "The software would allow us to spot and respond immediately to problems such as hot spots and bands on the tubes, refractory damage

and any flame impingement. We use extensively the Isotherm temperature measurement mode within the software which allows us to highlight areas of a thermal image which are within a selected temperature range. Areas within the isotherm's range are displayed in our chosen colour for clear visibility and are key to our comprehensive understanding of tube performance."

CONCLUSION

Mr Navarro continues "The implementation of the thermal imagers has allowed us to gain furnace know-how. Now, our teams are able to monitor the temperature of the tubes continuously, they are able to make more informed and confident decisions implying greater plant reliability".

Following confirmation that the plants are increasing know-how by continuously measuring temperature of tube walls has led to Air Liquide's Research and Development team approving the NIR-B 3XR thermal imager for potential installation in additional steam methane reformers.

SPECIFICATIONS

Measurement Range:	600 to 1800 °C / 1112 to 3272 °F
Spectral Response:	0.85 to 1.05 µm
Frame Rate:	7.5 fps (100M Ethernet)
Image Pixels:	640 x 480
Accuracy:	1.0 % Celsius
Sealing:	IP 65 (when connections mated/fitted with caps)
Repeatability:	1 °C
Data Out:	Digital data over 100M Ethernet (M12, 8 pin)
Software:	Complete Land Image Processing Software (LIPS) package for Windows
Standard Accessories:	Field Connection Box (ExHazloc) and cables (10 m, 25 m or 50 m), software, water cooled/purged mounting and tube
Field of View (Horizontal):	90°
Focus Range:	1000 mm to infinity
Probe Length:	305, 609 or 914 mm (12", 24" or 36")
Probe Diameter:	57 mm (2.24 in.) max.
Mountings:	Choice of 3" ANSI 150 RF Flange & Gasket or PN16 DN80 Flange & Gasket with a 12" standpipe
Dimensions:	254 x 560 x 717 mm (or 1021 mm or 1326 mm) 10" x 22" x 32" (or 44" or 56")
Power Rating:	21.6 - 26.4 V dc, 0.6 A
Weight:	< 25 kg (for 609 mm / 24" version)
Hazardous Area Certification: <i>EX Borescopes</i>	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)
Field Connection Boxes	EX FCB 31: Ex nA nC [op-is Ga] IIC T4 Gc Tamb=-25 °C to +54 °C (ATEX certificate: CML 15ATEX4085X) EX FCB 32: Class I, Division 2, Groups A, B, C, D; T4 Tamb=-25 °C to +50 °C (CSA certificate for US and Canada: 70052791)

SEE OUR RELATED LITERATURE FOR THE NIR BORESCOPE 3XR:

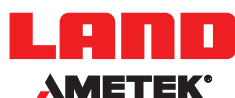


NIR BORESCOPE 3XR

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Land Instruments International
Stubley Lane, Dronfield
S18 1DJ
United Kingdom

Tel: +44 (0) 1246 417691
Email: land.enquiry@ametek.com
www.landinst.com

AMETEK Land - Americas
150 Freeport Road,
Pittsburgh, Pennsylvania, 15238
United States of America

Tel: +1 (412) 826 4444
Email: land.enquiry@ametek.com
www.ametek-land.com

AMETEK Land China Service
Part A1 & A4, 2nd Floor Bldg. 1
No. 526 Fute 3rd Road East,
Pilot Free Trade Zone 200131
Shanghai, China

Tel: +86 21 5868 5111 ext 122
Email: land.enquiry@ametek.com
www.landinst.com

AMETEK Land India Service
Divyasree N R Enclave, Block A,
4th Floor, Site No 1, EPIP Industrial Area
Whitefield, Bangalore- 560066
Karnataka, India

Tel: +91 - 80 67823240
Email: land.enquiry@ametek.com
www.landinst.com