

INNOVATION AT WORK

Connecting Visionaries in Radiation Safety, Science and Industry

Conrad Orlando Resort, FL – July 28th – August 1st



Recent Advances in High Temperature Cameras for Industrial Applications

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Mirion Connect | Annual Users' Conference 2025
Orlando, Florida



High Temperature Cameras





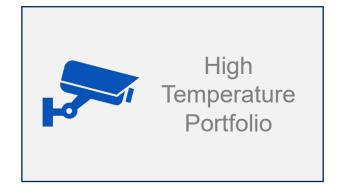
High Temperature Cameras in Industrial Applications

- Over the last decade customers are asked to better control their process due to cost savings, process efficiency for better product yield & from an environmental factor of energy use & carbon emission goals.
- To achieve this technology advancements are required to help better control the processes & give real time feedback to operators that help them take corrective action at an earlier stage in the process saving downtime, improved process efficiency & provide cost benefits.



Agenda

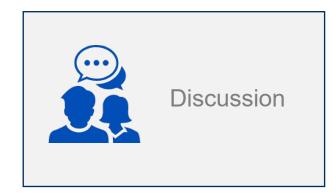






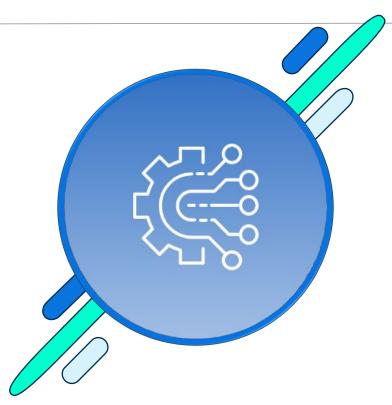








Industry Served





Cement Industry

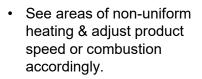
- Rotary Kilns Monitor cement & lime kiln product & temperatures.
- Cement Clinker Coolers -Monitor the cooler for red rivers & upset conditions.





Fossil Utility Boilers

- Observe flame shape & temperature of each burner.
- Aid in controlling NOx levels.



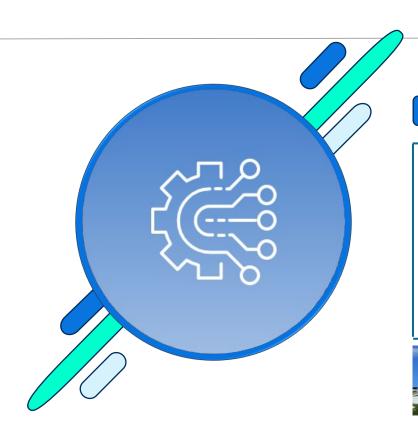
Steel & Aluminium Furnaces







Industry Served





Waste to Energy Plants

 Live monitoring of burning processes, anticipate maintenance requirements ahead of time





Glass Furnaces

 View for flame impingement & product flow. Accurately measure refractory temperatures.



Pulp & Paper Processing

- Monitor smelt bed & check for blockages in ports without having to shut down operations
- Pyrometers monitors product & prevent burning so product meets the quality standards.







Camera Portfolio: Infra Red





Camera Portfolio: Visible



 Patented color video camera & scanning pyrometer; monitors process while measuring the temp of any area in the field of view





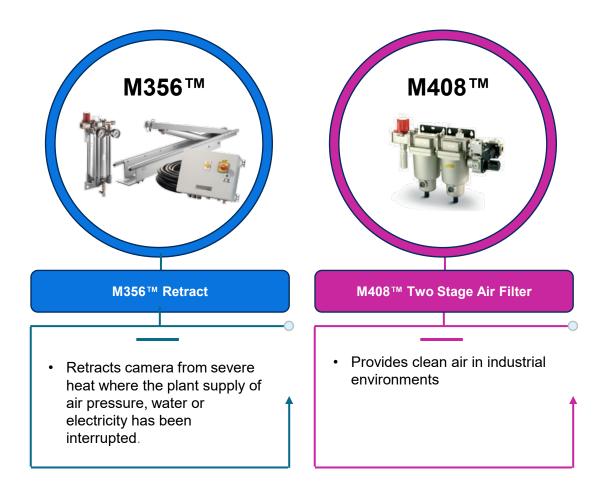
- Visible Light Color Camera
- Straight, oblique, or right angle lens tube options available



 Supports 1 or 2 Mirion cameras, providing both imagery & precise temp measurement



Camera Portfolio: Accessories





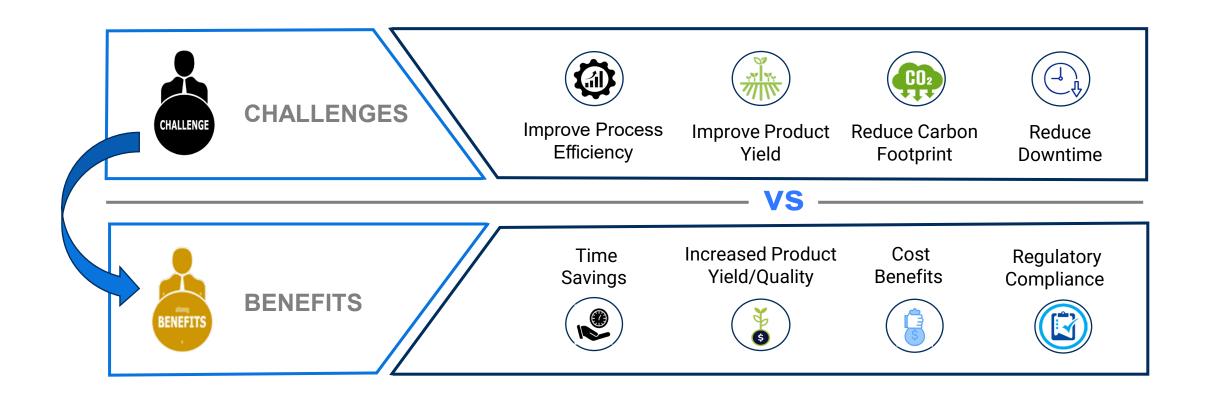
High Temperature Cameras

New Developments





Customer Business Challenges vs Benefits



Need for High Quality Image & Temperature Accuracy to take corrective action earlier in the process

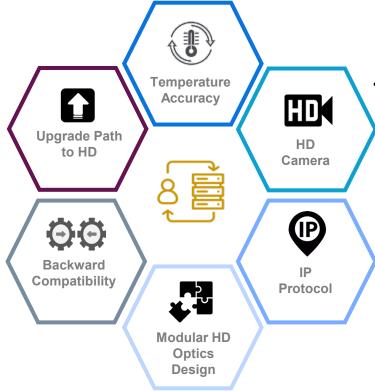


Product Requirements

• Highest <u>Temperature Accuracy</u> to maximize efficiency of Process

 <u>Future Upgrade Path</u> of platform for future proofing

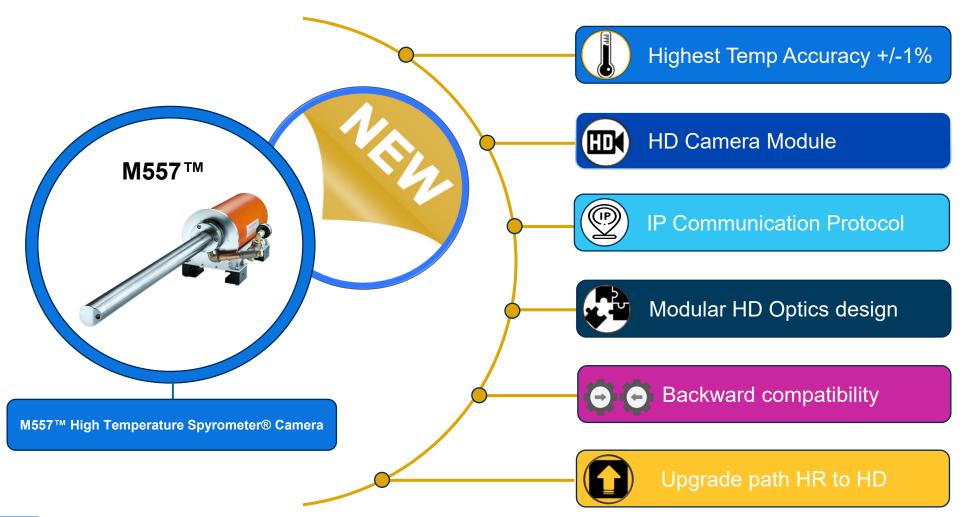
<u>Backward compatibility</u> to existing infrastructure for simplified upgradeability



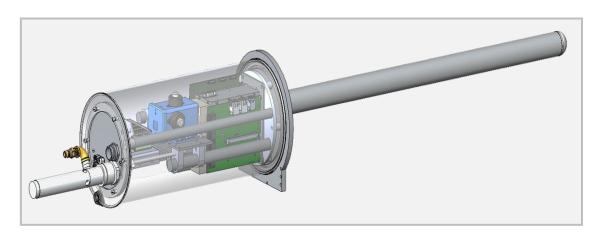
- Customers looking for <u>Higher Definition Color Image</u> to improve process efficiency
 - Differentiate critical vs noncritical maintenance
 - Increase yield & quality of their product
 - Efficient fuel burn & usage Lowering Carbon footprint
 - Simplified data & image transfer using <u>Standard</u> <u>Communication Protocols</u> lowering barrier to adoption











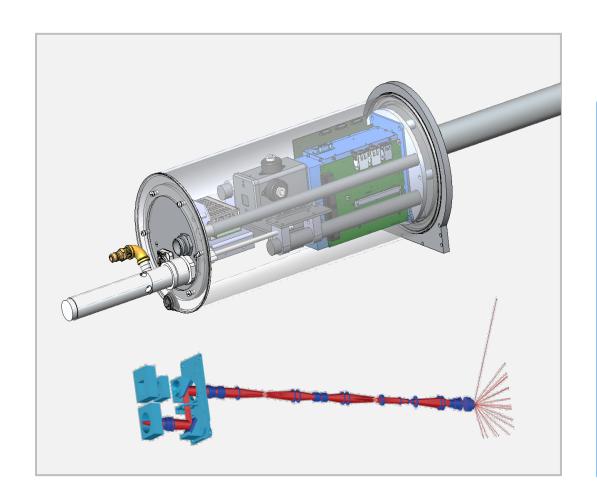
Pyrometer Type & Wavelength	Temperature Range ^o F	Temperature Range ^O C
Dual: 800nm & 1600nm	1225 - 2991	663 - 1255
Dual: 800nm & 1600nm	1558 - 3301	848 - 1816
Dual: 800nm & 1600nm	1382 - 2650	750 - 1450
Single 1600nm	800 - 2500	427 - 1371



Highest Temp Accuracy +/-1%

- Dual wavelength best suited for kiln, boiler & furnace applications requiring high-quality, color images & multi-point temp measurements
- Single wavelength best suited for clinker coolers & other lower temp applications that require high-quality, color images & temp measurements

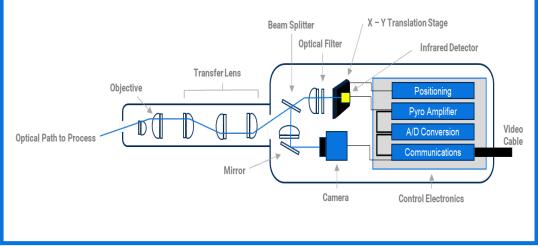
Spyrometer has several temperature measurement options that allows it to be customized to suit application

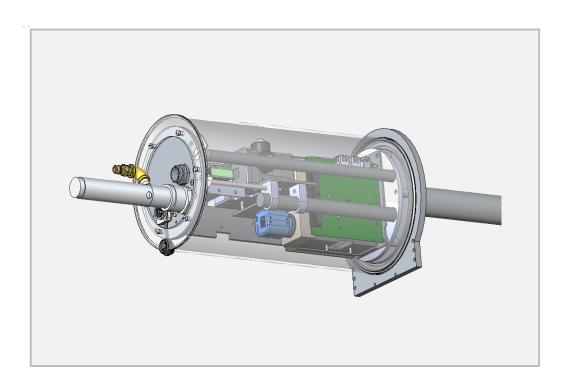




Highest Temp Accuracy +/-1%

- Optical signal is divided in two by beam splitter
- One part goes to a video camera, other to the pyrometer













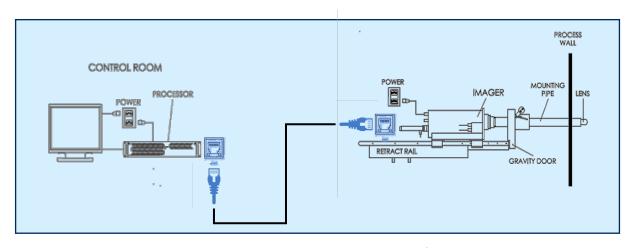
HD Camera Module

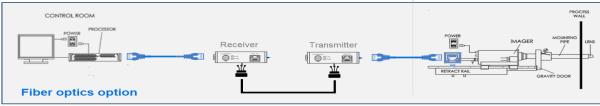
Camera		
Detector	Solid state color image sensor	
System Resolution	• 1080p (1920x1080)	
Video	Video Compression H.264 30 FPSONVIF Compliant	
Transmission	• IP Video	
Control	Iris adjustment on rear of unit; remote iris adjustment from the processor	
Application Filter	Filters provided to match process & maximize performance	

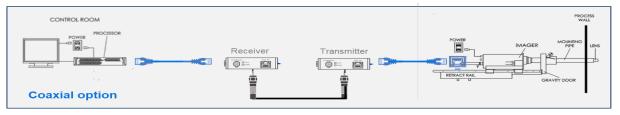




- · Key Benefits and value
- Simple implementation into existing IP infrastructure lowering cost of implementation
- Kits available to connect to existing coaxial / Fibre Optic cabling lowering barrier to adoption











Modular HD Optics design

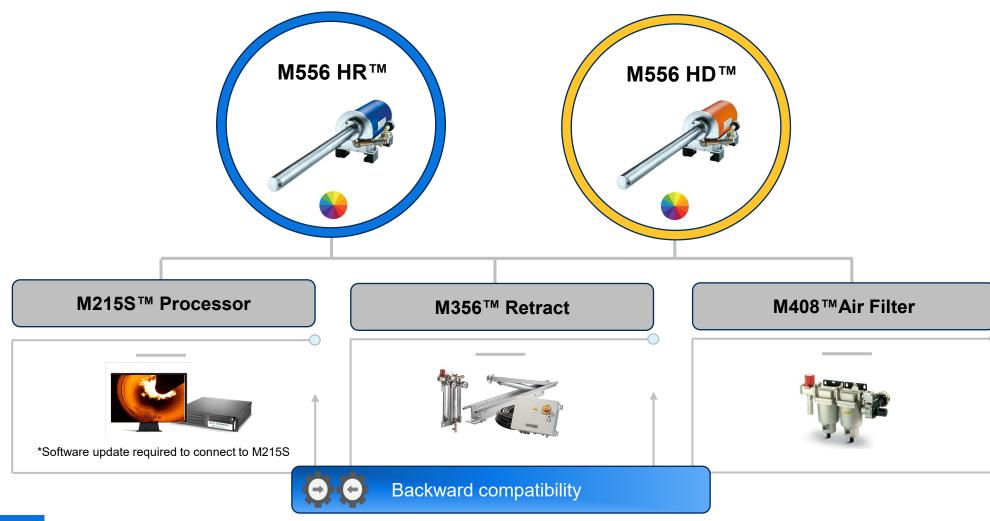
Lens: Resolution is stated at 1080p			
Construction	Air or water-cooled 304 stainless steel outer shroud; sapphire window for max. environmental protection.		
Diameter	• 38 mm (1.5 in.)		
Cooling Requirements	Instrument quality air		
Thermocouple	TJ: Type J thermocouple option;TK: Type K thermocouple option		
Front Objective Field of View	• 90° HFOV, 75° HFOV, 50° HFOV, 35° HFOV		

Length	Straight Lens	45° OAL Lens	Water Cooled Lens
18 in.	>		
24 in.	~	~	~
30 in.	~	~	~
36 in.	~	~	~
42 in.	~	~	
48 in.	>		>

Optics designed so that the 4 FOV's & 6 lengths all utilize the same elements but in different configurations









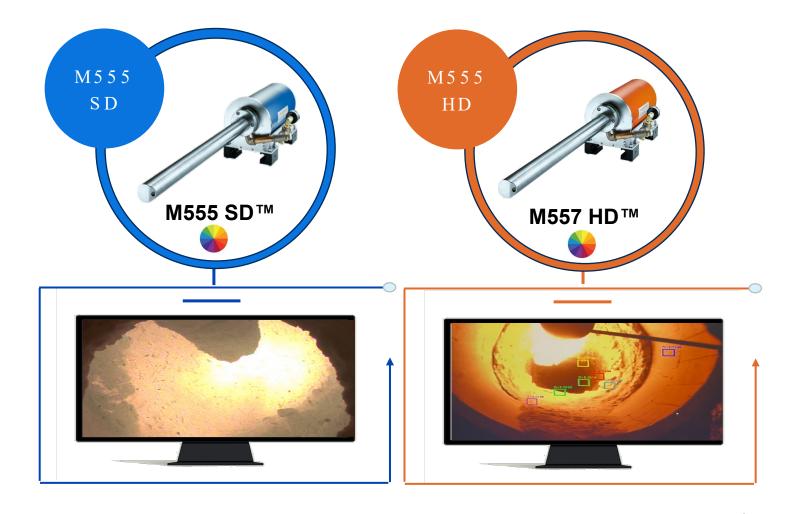


Upgrade path HR to HD



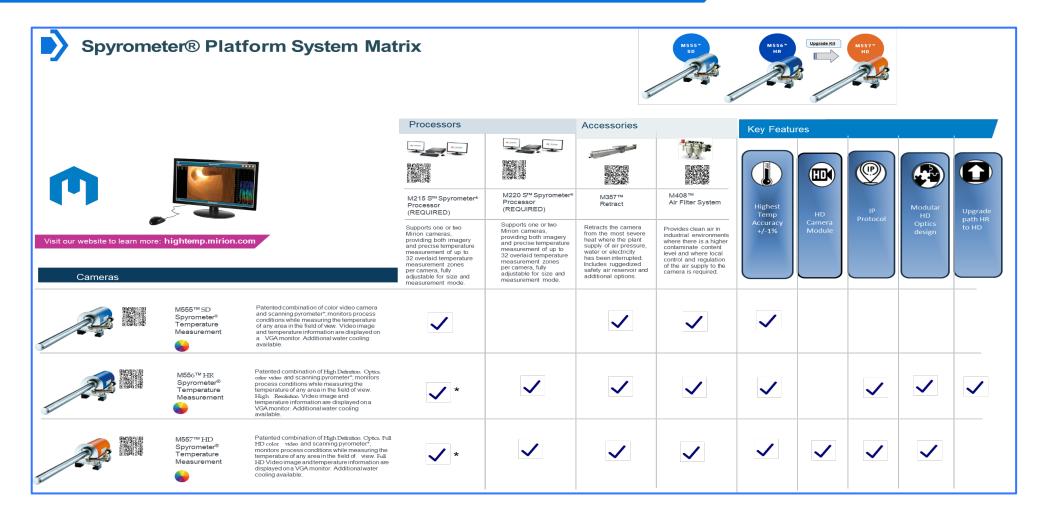


M557™ HD Spyrometer in Action





Spyrometer Platform Matrix Chart





Rod Less Retract

New Developments

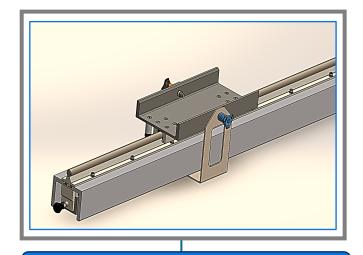


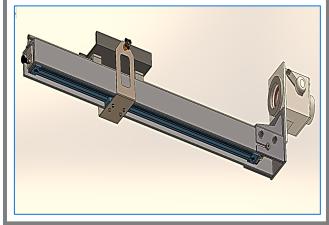


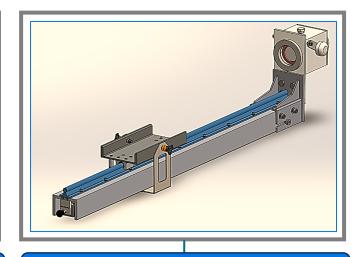


M357™ Rod less Retract









Quick Release Locking Pin

Rodless Cylinder

Monorail

Locking quick release pins (Shown in blue)

Allows camera to be removed from retract quickly

Rodless cylinder (Shown in blue)

- Saves on space
- Provides added safety, moving components do not protrude from the assembly's footprint

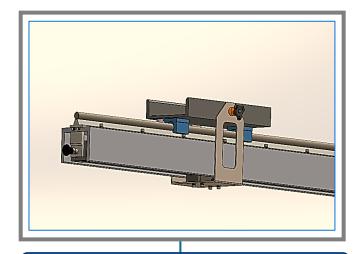
Monorail (Shown in blue)

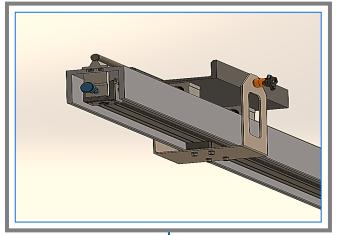
- Easier to service:
- Greater Uptime: Less moving parts
- · Improved Cost of Ownership

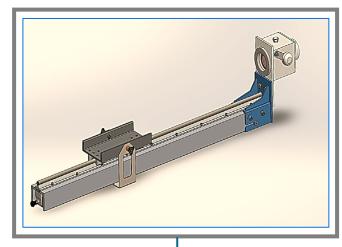


M357™ Rod less Retract









Linear Bearings

Quick Release Rear Pin

Mount Design

Linier bearings (Shown in blue)

- Greater Uptime: Allows for a smoother delivery of the camera in turn having a
- Better cost of ownership

Rear quick release pin (Shown in blue)

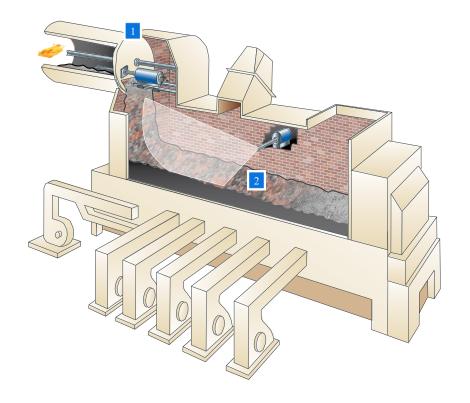
- Allows the cylinder to be released & locked into place with ease
- Easier & quicker to service & carry out maintenance

New mount design (Shown in Blue)

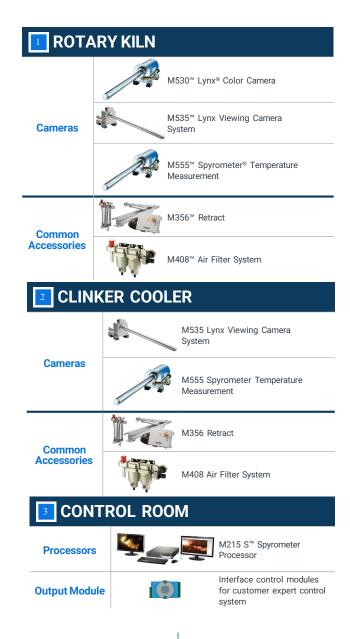
 Attach to current gravity door or flange mount. Slot locates onto shoulder bolt, allowing one person installation



Cement Plant Camera Uses

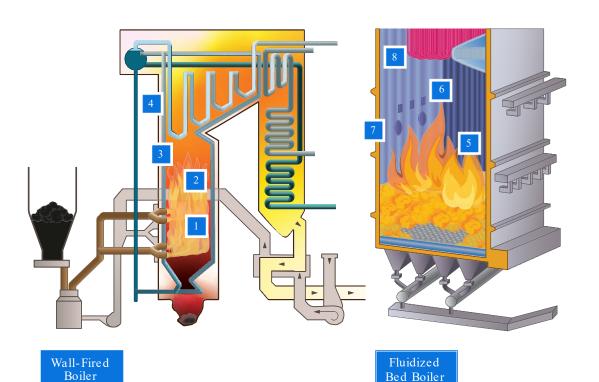








Thermal Boiler Camera Uses



1	WALL-FIRED BOILER INSPECTION	EQUIP MENT	
	Burner Start-Up		
	Ensure even burner lighting and changeover	M535 Camera	
2	Fireball Observation		
	Observe shape and color of flame	M535 Camera	
3	Water-Wall Slagging		
	View through fireball and identify	M540 Camera	
	build-up	M560 Camera	
4 Superheater Tube Slagging			
	View through flame/particulate to	M540 Camera	
identify problems		M560 Camera	
7LI	UIDIZED BED BOILER INSPECTION	EQUIP MENT	
5 Boiler Startup			
	Ensure even burner lighting and changeover	M535 Camera	
5	Bed Observation		
	Ontimina Efficiency/Identify Instability	M535 Camera	
	Optimize Efficiency/Identify Instability	M560 Camera	
7	Water-Wall Slagging		
View through fireball and identify	M540 Camera		
	build-up	M560 Camera	
3	Superheater Tube Slagging		
	View through flame/particulate to	M540 Camera	
	identify problems	M560 Camera	

MIRION HIGH-TEMPERATURE CAMERAS M535™ Lynx® High Temperature Color Camera Series M540™ Lynx High Temperature Black and White IR Camera Series











CAMERA ACCESSORIES M610S Calico™ 3 Dual Infrared Imaging Processor



M356™ Automatic Retraction System

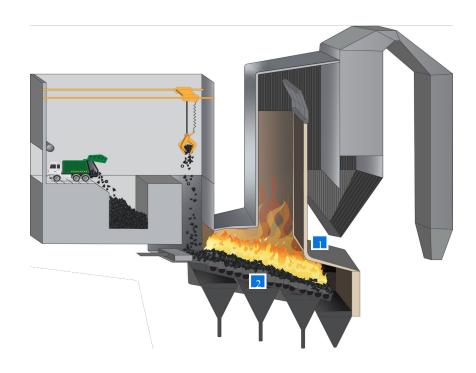


M408™ Two Stage Air Filter

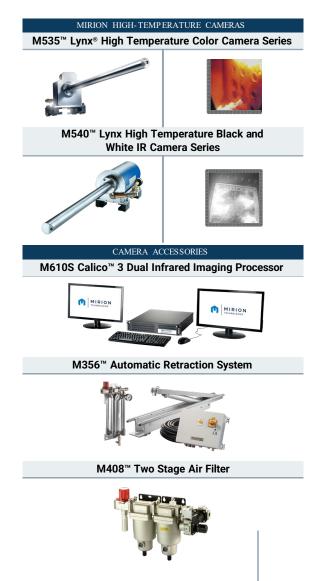


Innovation at Work

Energy from Waste Plant Camera Uses



	AREA OF OPERATION	EQUIPMENT
	СНИТЕ	
	Identify build-up of bottom ash or obstruction in the chute or trough	M540 IR Camera
2	2 GRATE	
	Monitoring grate distribution and combustion	M535 Camera





Supporting Material

Brochures



Cameras for Extreme Environments



High Temperature Cameras for Industrial Applications



Datasheets

Website





Infographics



Webinars



Thank you



