Diamond Electronics History:

- 1946 first closed circuit television installation
- Located in central Ohio since 1946
- Started in electric utility, heavy industrial, government, and commercial ventures
- Sold to Arvin Industries in 1972
Acquisition:

- DPII acquired Diamond Electronics industrial market CCTV business from Ultrak Inc (successor to Arvin) on July 27, 2001
- Relocated to DPII Lancaster facility
- Merged CCTV business with DPII Diagnostics business
Applications:

- Industrial CCTV Wall-Eye Camera
- Solid State IR Cameras
- Boiler Diagnostic Systems
- Process Surveillance & Security Systems
Wall-Eye Camera System:

**System Features:**

- Over 480 Lines Resolution
- No Water Cooling Required
- Replaces Existing Wall Boxes and Water Shrouds
- Operates in Furnace Temperatures up to +3000 °F
- Uses Dual Vortex Coolers for Cooling
- Minimal Maintenance Compared to Lenstubes

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Wall-Eye Camera System:

System Features Cont’d:

- Optional 4-20mm Motorized Zoom Lens
- Available In: NTSC, PAL, or Monochrome (EIA)
- Lengths Vary from 18” to 36”
- Optional Pneumatic Retract Available
- Water Cooled Right Angle Configuration Available
- 24” and 36” F:8 Wall Box Replacement Systems
Wall-Eye Applications

-Steel-

Reheat Furnaces

- Slab Position (Charging Furnace)
- Billet Position
- Combustion and Flame Pattern
- Peel Bar Billet Position
- Coiler Insert Position
Wall-Eye Applications Cont’ d

-Glass-

Melt Tank
  • Batch Feeder, Observation Flow Status
  • Batch Melt Process, Ensure Proper Melting of Glass
  • Burner Combustion
  • General Observation of Refractory Walls

Plate Glass Float Tanks
  • Observation of Knurl Position (Tin Bath)
Wall-Eye Applications Cont’ d

-Cement-

• Rotary Kiln Observation
• Clinker Cooler Observation

-Power-

Boilers

• Furnace Flame Observation
• Superheater Observation for Slag Build-Up
• Ash Pit Observation, Slag Discharge
• Cyclone throat & Slag Tap Observation
Steel Industry

Actual Wall-Eye Images:

- Walking Beam Reheat
- Heat Treat
- Push Bar Reheat
Steel Industry

Actual Wall-Eye Images Cont’d:

- Peel Bar

- Slab Reheat
Glass Industry

Actual Wall-Eye Images:

- Melt Tank

- Tin Bath
  (Right Angle Wall-Eye)
Cement Industry

Actual Wall-Eye Images:

- Clinker Cooler
- Rotary Kiln
Power Industry

Actual Wall-Eye Images:

- Flame Viewing
Power Industry

Actual Wall-Eye Images:
- Cyclone Slag tap
- Ash Pit
- Cyclone Throat
Solid State IR Camera

SmeltCam™ Infrared Camera

Diamond Electronics
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SmeltCam™

Overview

- Solid-state infrared camera with no vidicon tubes
- Views combustion processes in coal-fired boilers:
  - monitors smelt bed;
  - detects slagging and/or pluggage in pendant tube area;
    or
  - view liquor guns.
- Optimum wavelength penetrates fuming
- For negative or positive pressure furnaces
- Compact camera, no operator controls or adjustments
SmeltCam™

Benefits

- High-quality images for bed or pendant monitoring
  - Optimum wavelength for clearer pictures
- More accurate monitoring
- Two SmeltCam™ systems can provide 91 percent coverage on a recovery boiler
SmeltCam™

Benefits

• Reduced operating costs (time and money)

  • Dependable solid-state microprocessors and chips

  • **No lens tube**; no disassembly or cleaning

  • **No vidicon tube** to change or maintain
SmeltCam™

Benefits

- No camera calibration
- Maintenance payback (no technicians needed to make adjustments)
- No image drifting
SmeltCam™

Key Features

• Pneumatic retract system:

  • Automatic activation by low-pressure switch on air supply, thermal sensor near camera, or AC power failure

  • Can also be operator-controlled by using the control unit

  • Mounts in upright or inverted position

  • Withdraws in case of air system failure, camera high temperature, or electrical system failure
Key Features

- Alarm/character generator board in camera control box with temperature sensor unit:
  - 4 alarm inputs/4 contact outputs
  - Monitors voltage level and changes of state
  - Can add alarm messages to video signal
  - Optional 20-character programmable camera title and on-screen messages
SmeltCam

Actual SmeltCam™ Image:

Images taken from the same port at same time
Boiler Diagnostic Systems

Fireside Advisor:

- Pentium4 3.0 GHz based PC
- Windows XP P, W 98, NT, and 2000
- Up to 4 camera inputs
- Quad display capability
- 10 movable temperature cells per camera
- Top (10) different colorization scheme
- Displays a single camera view to 2/3 of the CRT
- Trending done internally in Excel spreadsheets
Fireside Advisor

Quad Display - 4 cameras  Single Display - 1 camera
Optical Pyrometers - GasTemp™

Methods of Measuring On-Line FEGT:

- HVT Probe

- Infrared Pyrometers GasTemp™
GasTemp™ XR

Range: 575° - 2800 °F (standard calibration)

Accuracy: +/- 50°F regardless of coal type, natural gas and fuel oil
GasTemp™ RB

Range: $575^\circ - 2800^\circ F$ (standard calibration)

Accuracy: $+/- 50^\circ F$ recovery black liquor natural gas and fuel oil
GasTemp™ XR-S

Range: 575° - 2800 °F (standard calibration)

Accuracy: +/- 50°F coal, biomass, refuse, natural gas and fuel oil
Advantages with GasTemp™ XR

- Optical pyrometer
- Based on Planck’s Law for spectral emittance
- 575 to 2800 degrees Fahrenheit
- +/- 50 degrees accuracy
- On-line or start-up measurement
- Digital display and 4-20mA output
- Pre-calibrated to boiler width
- Non-intrusive - “point and shoot”
GasTemp™ Temperature Measurement

Gas Temperature

Average Temperature Profile

Instrument Installed at this Wall

Boiler Width

Increasing Temperature
Field Trial, GasTemp™ Online Test

Gastemp V.S. HVT Probe  Oklahoma Power & Electric

- Temperature (°F)
- Insertion in boiler (FT)

Graph showing the comparison of Gastemp and HVT temperatures as a function of insertion in the boiler.
Methods of Measuring Startup FEGT:

TP-500

GasTemp™
Field Trial, GasTemp™ Startup Test

SCE&G Wateree Unit 1 Startup  Plant's Gastemp Sidewall

Temperature (Deg. F)

Time

- Gastemp-XR
- TC CORREC.
Advantages of GasTemp™ RB

- Detect pluggage, improper air-delivery and elevation of combustion zone
- For black liquor, oil, or natural gas firing
- Used in forced, induced, or balanced draft boilers
GasTemp™ RB Specifications

- Digital display and 4-20 mA output
- Pre-calibrated to boiler width
- Non-intrusive- “point and shoot”
- Auto-Retract and port cleaning device
GasTemp™ Port Cleaning Device

- GasTemp™
- Port Cleaning Device
- Penetrating Pipe
- Flange
- Universal Mounting Plate
- Twin 2 inch Air Cylinders
- Mounting Rail

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Carryover Monitoring System (CMS)

• An apparatus for detecting carryover of unburned fuel particle
• Hot unburned particles appear as streaks
• Signals indicative of carryover compared to a threshold level
• Particle signals above threshold counted over a measured time interval
• Dividing particle count by the measured time interval produces a count rate
Carryover Monitoring System Features

- Optical Device - single point detector
- Near IR sensitivity
- Device operation independent of rotational variations
- 0 – 100 counts/sec
- Digital display and 4-20 mA output
- Non-intrusive – “point and shoot”
CMS Maintenance

- **Air Filter**
  Replace air filter cartridges every 6 months
- **Objective Front Cover**
  Inspect & clean every 2-3 months
CMS Data Logging Equipment

• Panel Mounted
• Available in multiple inputs
• Vertical and Horizontal bar graphs
• Allows digital readings and alarm statuses on all channels
• Optional removable storage media
• Available in desktop and portable

DX 100/200

MV 100/200
Typical CMS Installation positioned at bull nose of recovery boiler
Boiler Diagnostic Systems - Recovery

- GasTemp™
- CMS
- IR Cameras

- Fireside Advisor
  Control Room
Boiler Diagnostic Systems - Utility

IR Cameras
GasTemp™
Wall-Eye

Fireside Advisor
Control Room
Process Surveillance & Security Systems

Process Viewing Cameras

- High temperature fixed camera systems
- Air cooled / water cooled housings (HTH-8)

- Camera housings with heater & blower for extreme environments (CH112)

Demon III Cooler

HTH-8 Housing
Security Surveillance

- High-speed pan & tilt systems
- Fixed cameras
- Camera controls
- Switchers
- Video recorders
- Monitors
Pan & Tilt Camera Systems

System Features:

- High Resolution Color Camera w/18x Zoom Lens
- 360° Continuous Pan Rotation
- Variable Speed: .1° to 400° Per Second
- 100 Programmable Pre-Shots
- 10 Programmable Vector Scans
- Night Shot Feature
- Built-In Heater/Blower
- Optional Nitrogen Pressurized Housing
- Outdoor Weatherproof Configuration
- Heavy Duty Ruggedized Configuration
Digital Video Recorders

- 4, 8, 12, and 16-channel digital recorder
- Continuous (24/7) recording
- Frame rate default at up to 15 frames/sec on all 16 cameras
- Data stored on two internal high-capacity hard drives
- All cameras expandable to 640x480
- Play back/search by time, date and alarm
- Remote access via LAN/WAN/Internet
- Programmable recording/alarm modes
- Intelligent, real-time motion detection
- Front-end USB connection and CD-RW for quick data removal