

Field-based Gas Analyzers and Transmitters

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ROSEMOUNT[®]
Analytical


EMERSON[™]
Process Management

Outline

- Organization
- What we do?
- Capabilities in gas sensing
- Sensor technologies for methane
- What is next?

Emerson Process Management Overview

- Emerson
- Name changed from Fisher-Rosemount
- World's largest supplier of process management equipment and systems
- Worldwide sales of \$3.5 billion
- 17,000 employees at 200+ locations in over 60 countries

Emerson Process Management

Valves and Flow

- Fisher Controls
 - Valves
 - Regulators
- Micro Motion
- Brooks
- F-R Petroleum
- Daniel M&C
- Gulde
- Xomox
- El-O-Matic
- Con-Tek
- H. D. Baumann
- Francel
- Bettis Actuation
- Daniel Valves

Systems & Solutions

- Fisher-Rosemount Systems
 - DeltaV
 - AMS
- Westinghouse
- WPC
- Intellution
- PC&E
- Orion
- Kenonics
- CSI

Measurement & Analytical

- Rosemount
- Dieterich
- PI Components Senpro
- Rosemount Analytical
 - Liquid- Uniloc
 - PAD- Gas
 - Daniels

Rosemount Analytical Inc- PAD



**The world's premier
supplier of
instrumentation and
systems for process
analysis, emissions
monitoring,
combustion analysis
and boiler control.**

Our World...

- Combustion Control
- Continuous Emission Monitoring
- Process Control

- ❖ Field hardened and Robust
- ❖ Cost effective
- ❖ Analyzer/transmitter
- ❖ Stability, accuracy and precision
- ❖ High MTTF, low MTTR and high uptime
- ❖ Intrinsically safe, hazardous locations, explosion proof
- ❖ Diagnostics and self validation
- ❖ Easy calibration
- ❖ Critical measurements

Critical Measurements

- Safety
- Efficiency
- Maintenance
- Quality control
- Automation
- Compliance

Safety, cost savings and compliance

Analyzer Trends

From:

- Complex
- Hardware Supplier
- Proprietary
- Initial Cost of Purchase
- Sample Handling
- Features/Functions
- Fragile
- Analyzers as Data Sources
- Local Measurement

To:

- Plug & Play
- Solution Provider
- Open
- Total Cost of Ownership
- In-situ Probe
- ROI-Value
- Field Mounted
- Analyzers as Web Servers
- Plant-Wide Optimization

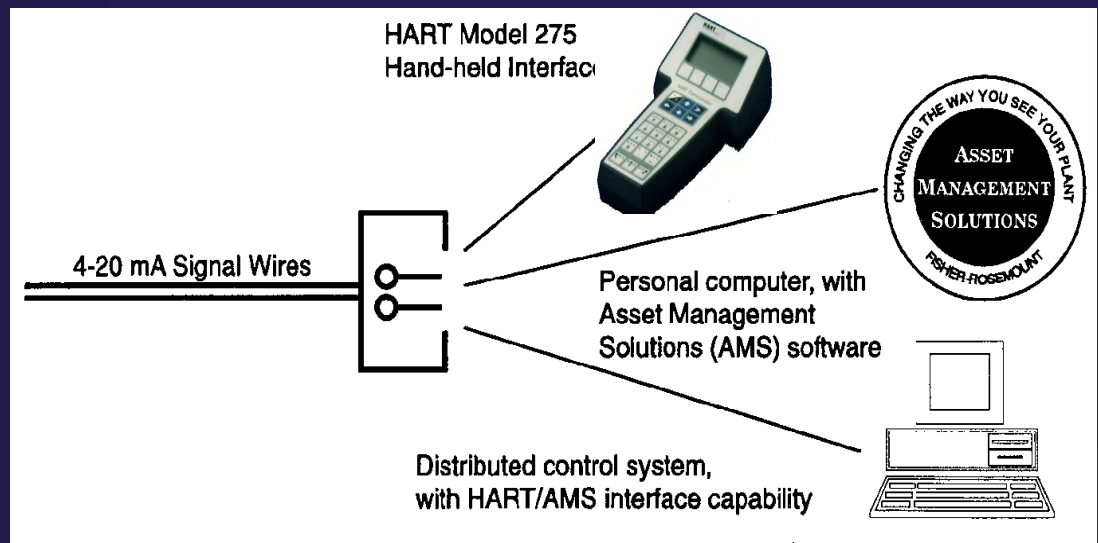
Field Based Gas Analyzers



Moving analysis to the point of measurement

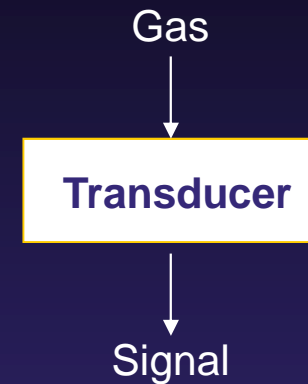
O₂/Combustible Transmitter + Methane

- O₂ and CO measurement for efficient operation (stoichiometric point).
- Split architecture/integrated electronics to sensor housing
- O₂ based on Zirconia fuel cell and CO by catalytic bead technologies
- Methane sensor to detect leakage of raw gas into the boiler
- Purge down and light off cycles of natural gas fired systems
- Explosion proof package- Integrated sensor and electronics



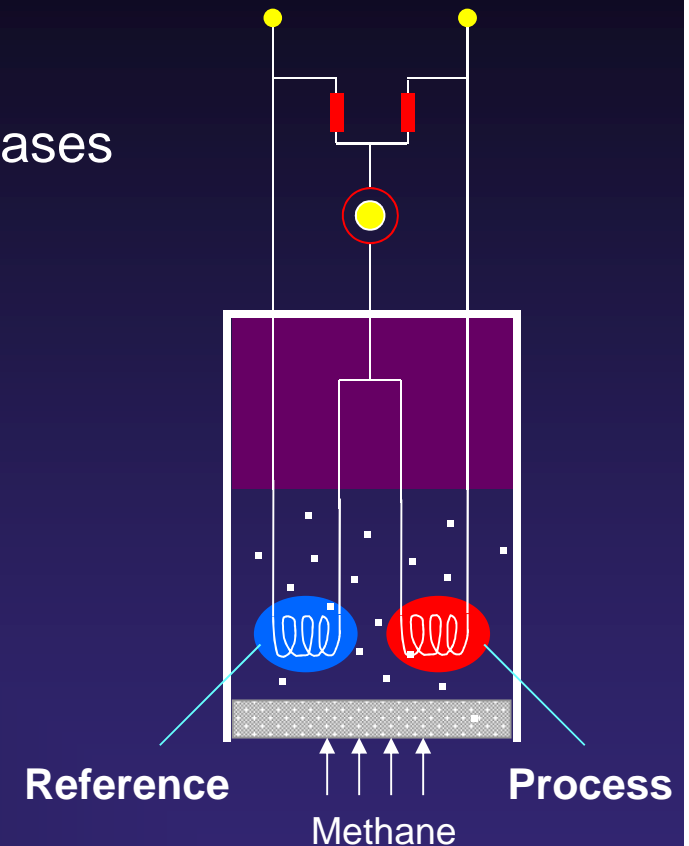
Analytical Technologies for Methane

- Calorimetric
- Mixed potential
- Semiconductor
- TCD
- FID
- NDIR
- Etalon
- FTIR
- GFC
- Laser remote detection (fence line, airborne, Lidar)
- CRDS

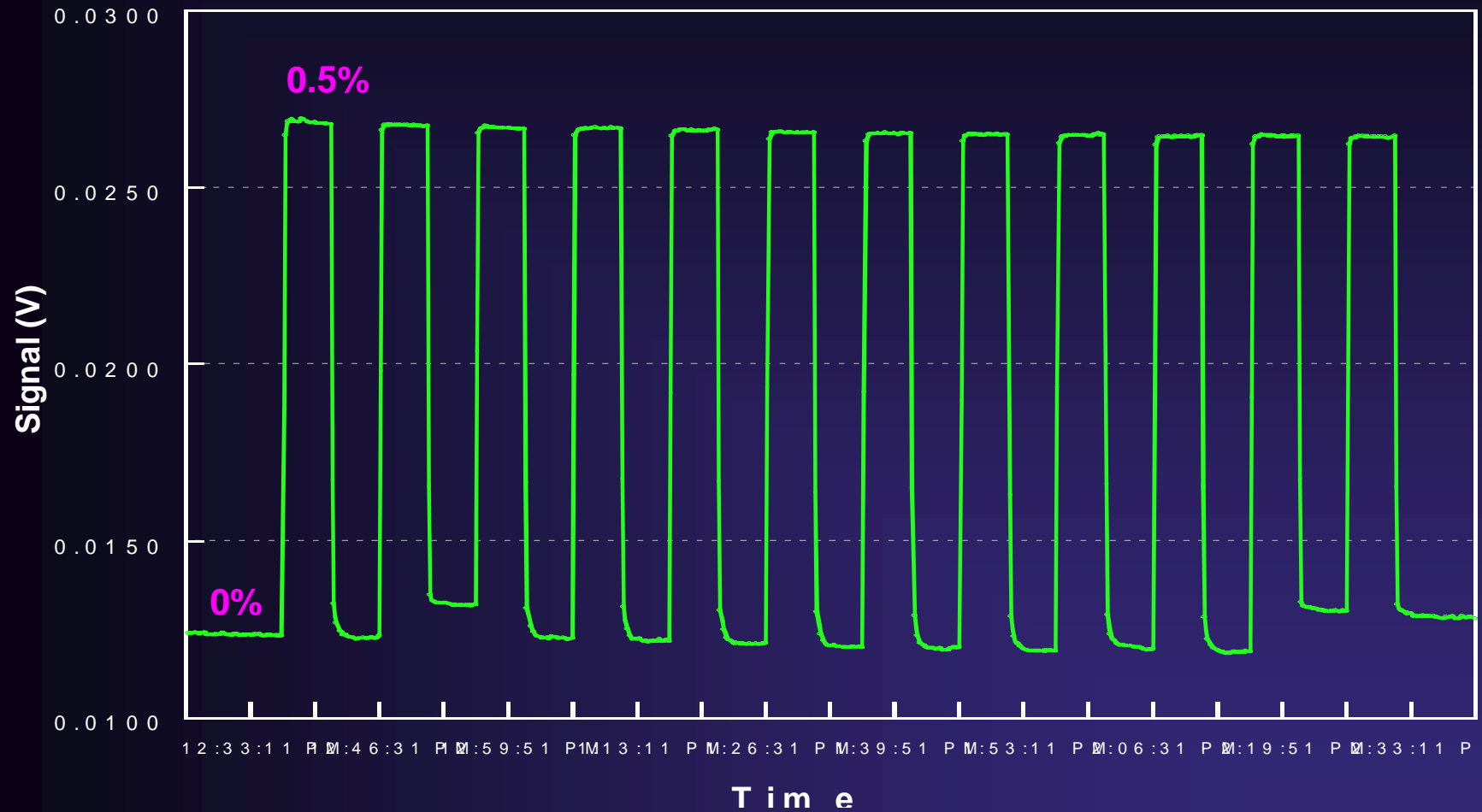


Calorimetric Sensor

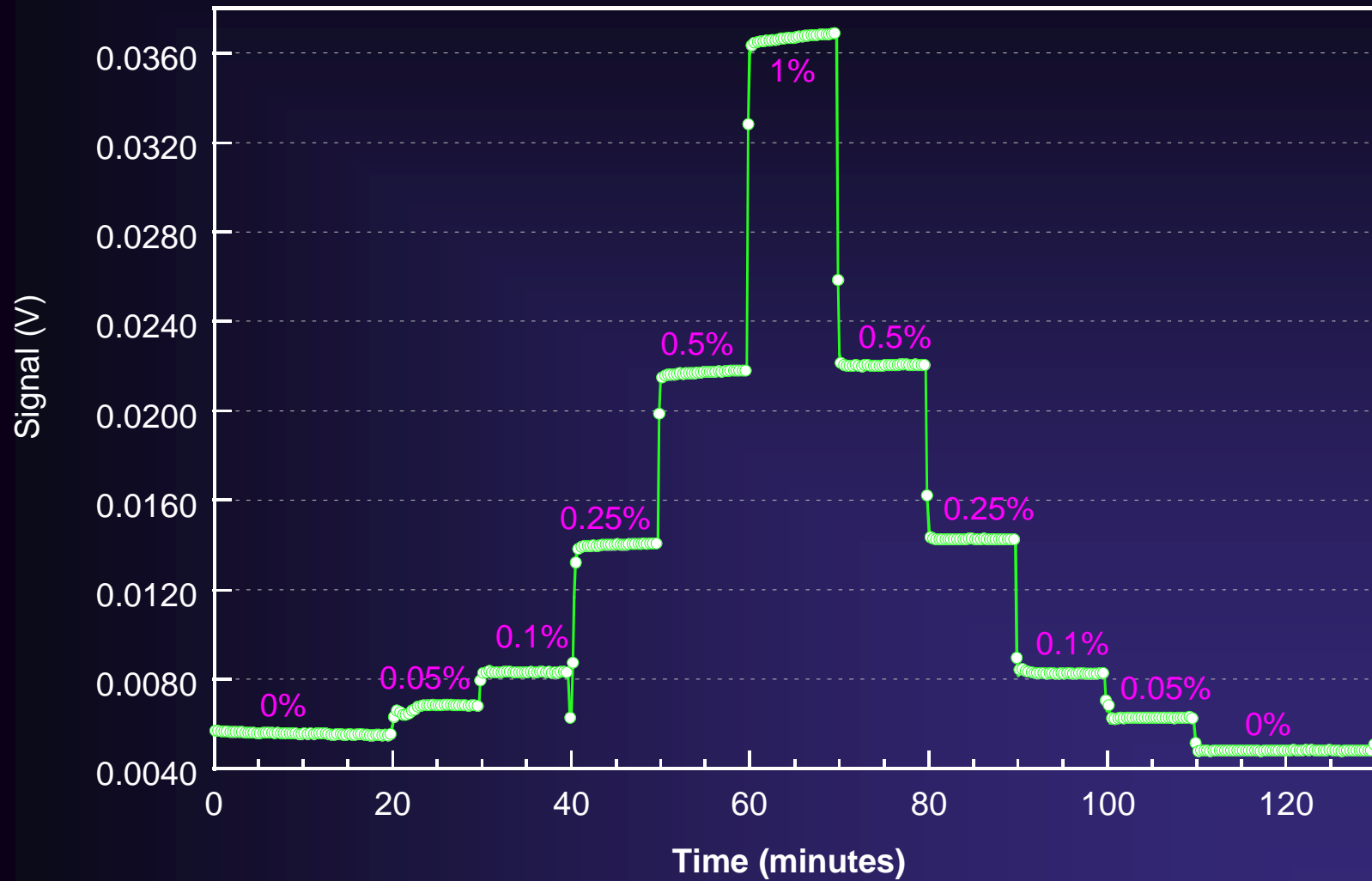
- Compact and inexpensive
- Measures temperature rise as a result of combustible reaction between combustible gases (hydrocarbons, CO), and O₂.
- Not very selective
- Good response
- Quantitative
- Amenable to field use
- Limited diagnostics
- Poisoning
- Cross interference
- Requirement of O₂



Calorimetric Methane Sensor: Repeatability

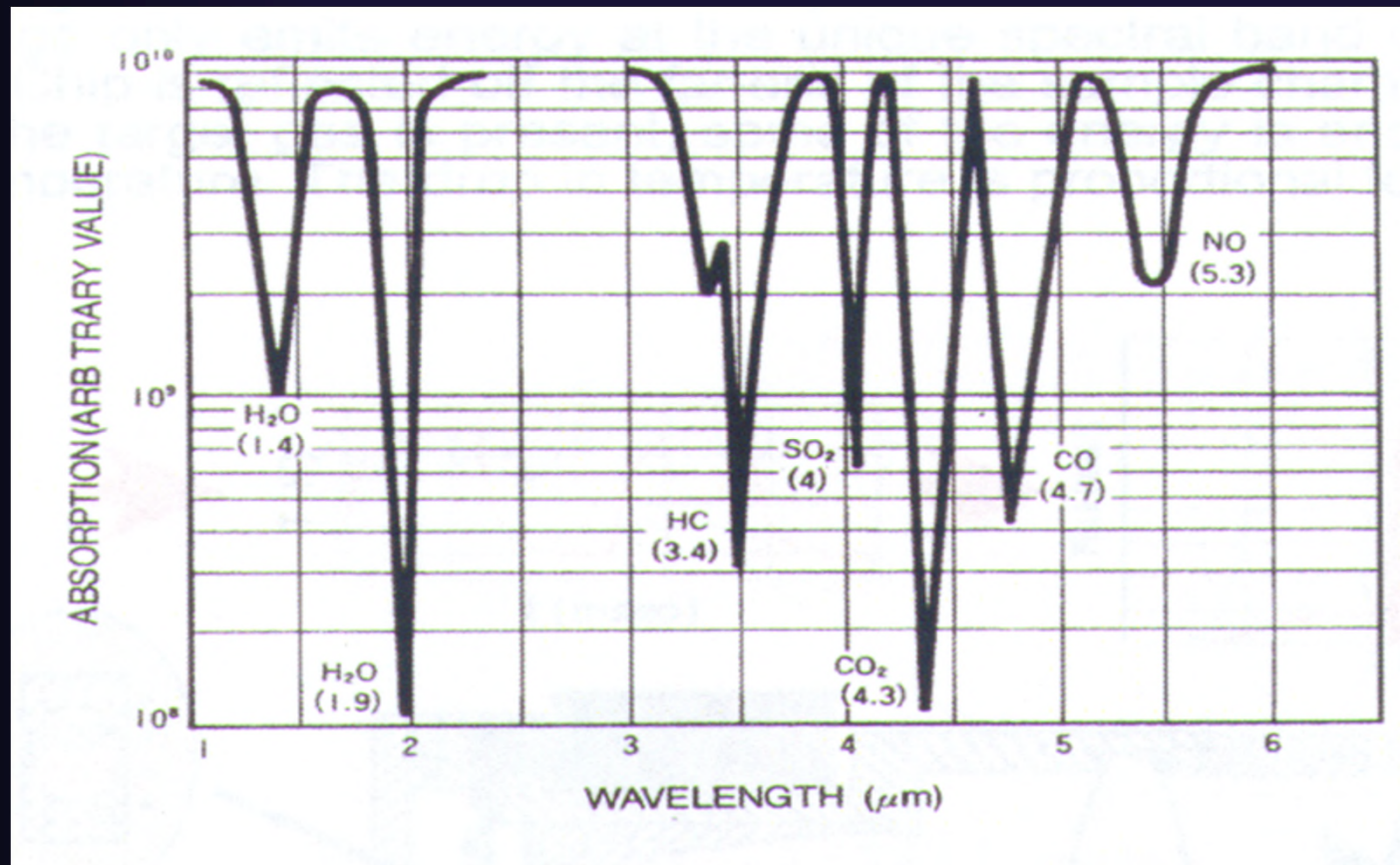


Calorimetric Methane Sensor: Response

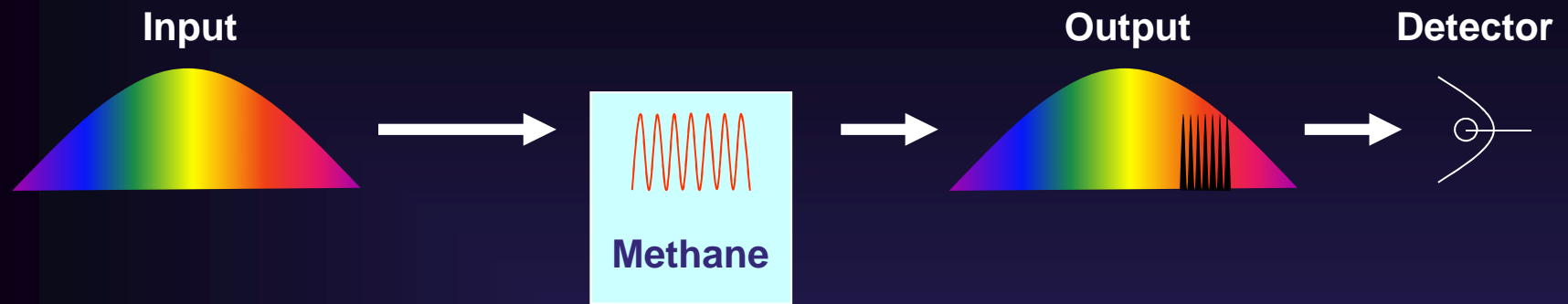


IR Absorption Sensors

- Non Dispersive Infrared absorption (NDIR)
- Etalon

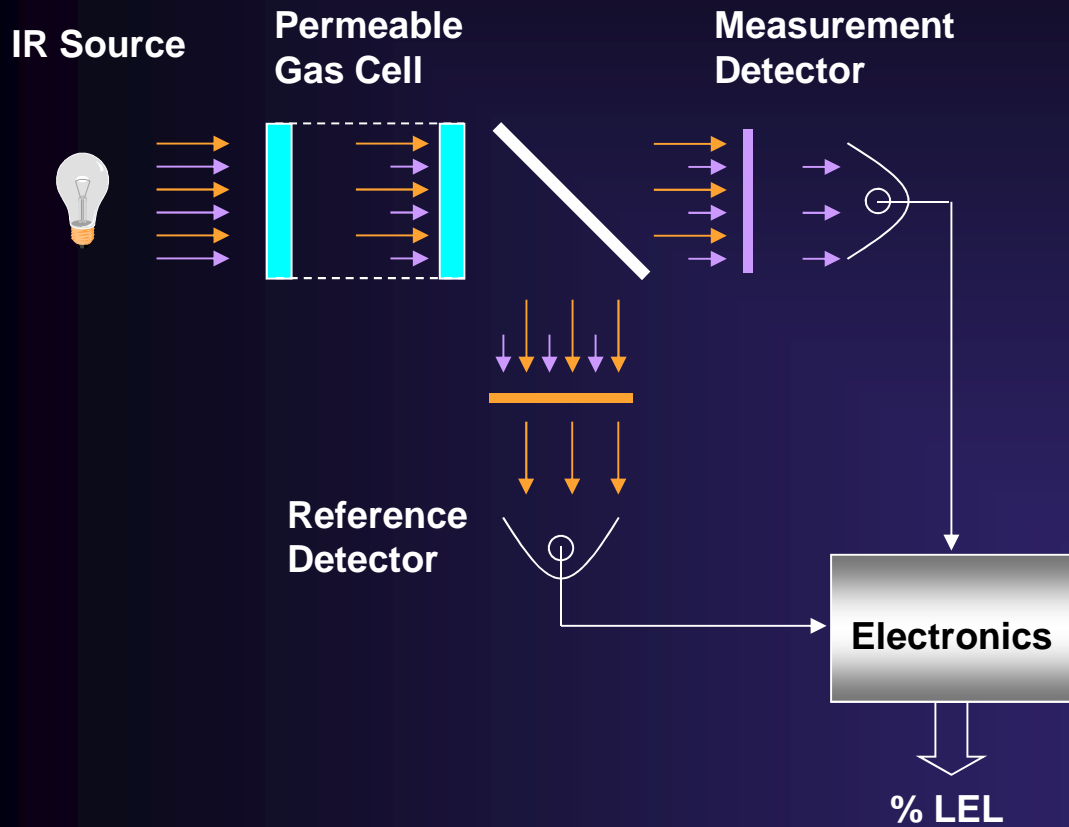


IR Absorption Sensors (NDIR)



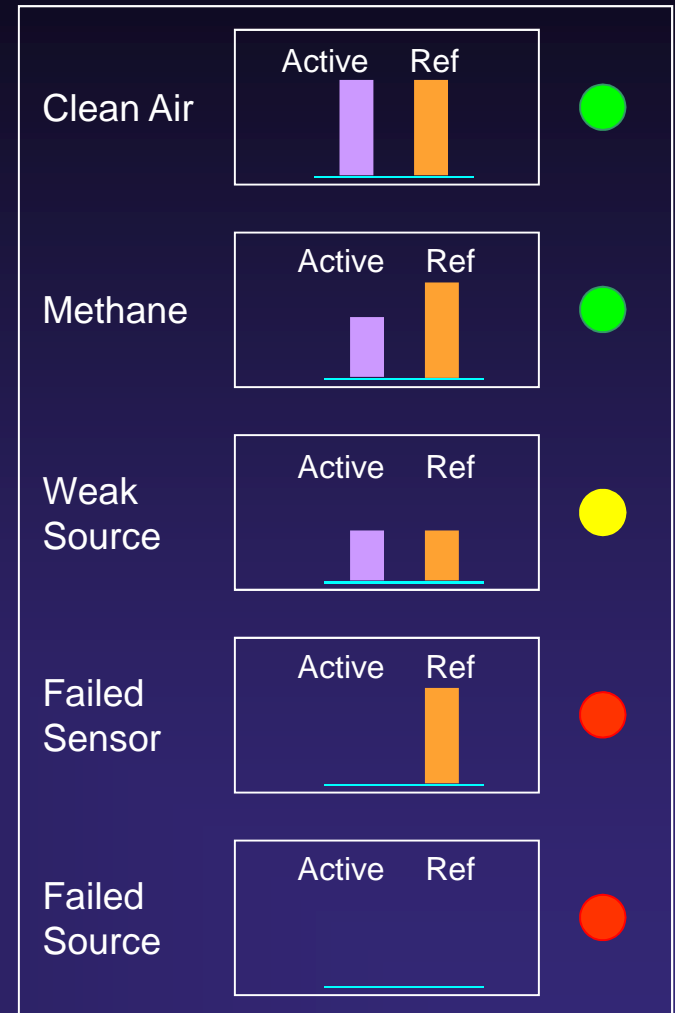
- Compact (built in IR light source and detector)
- Measures absorption of light by methane
- Selectivity is possible (minimal interference)
- Sensitive and quantitative
- Continuous measurement
- Diagnostics implemented

NDIR Methane Sensor: Diagnostics

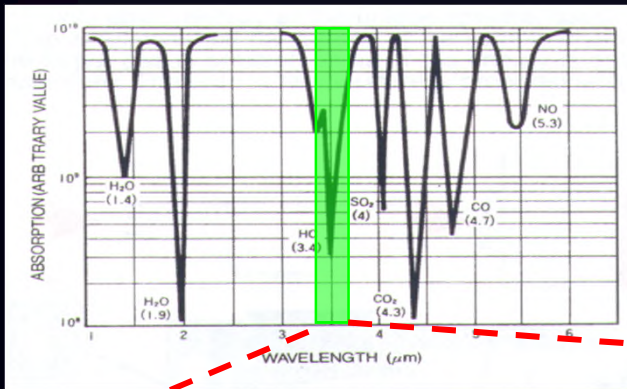


John Jarvis, Detector Electronics

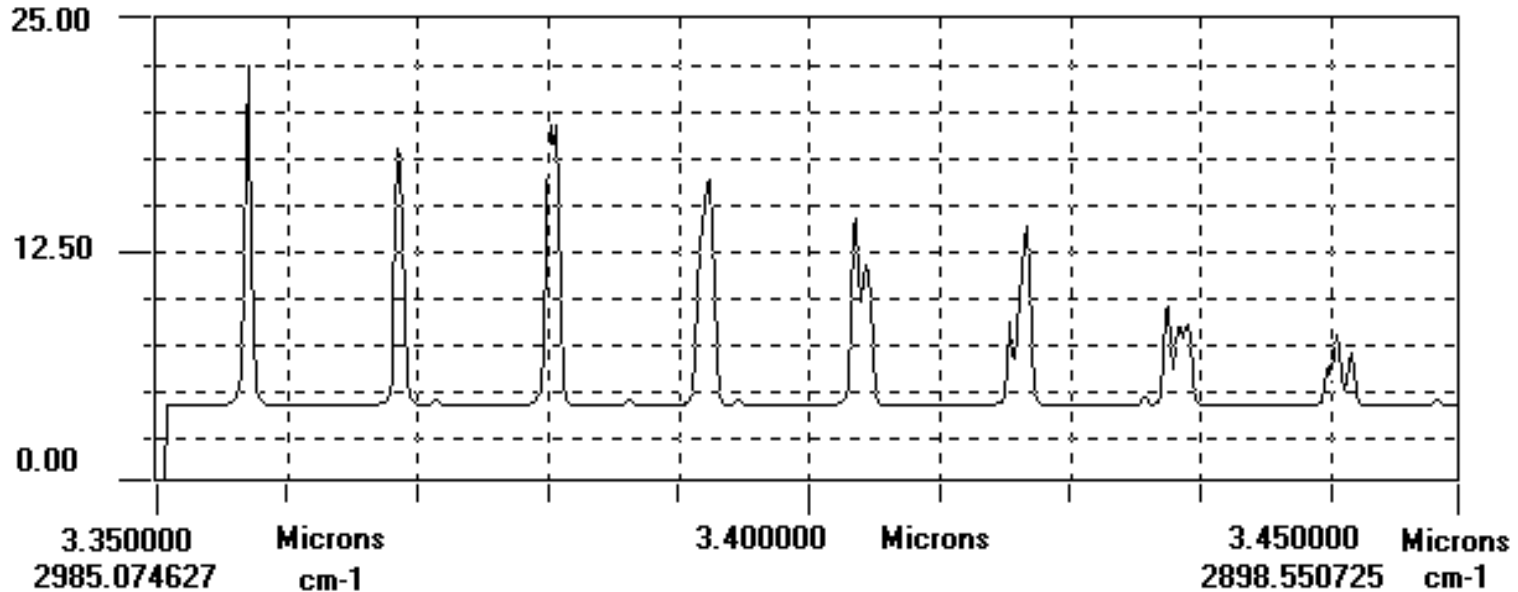
IR Signal Analysis, Diagnostics & Status



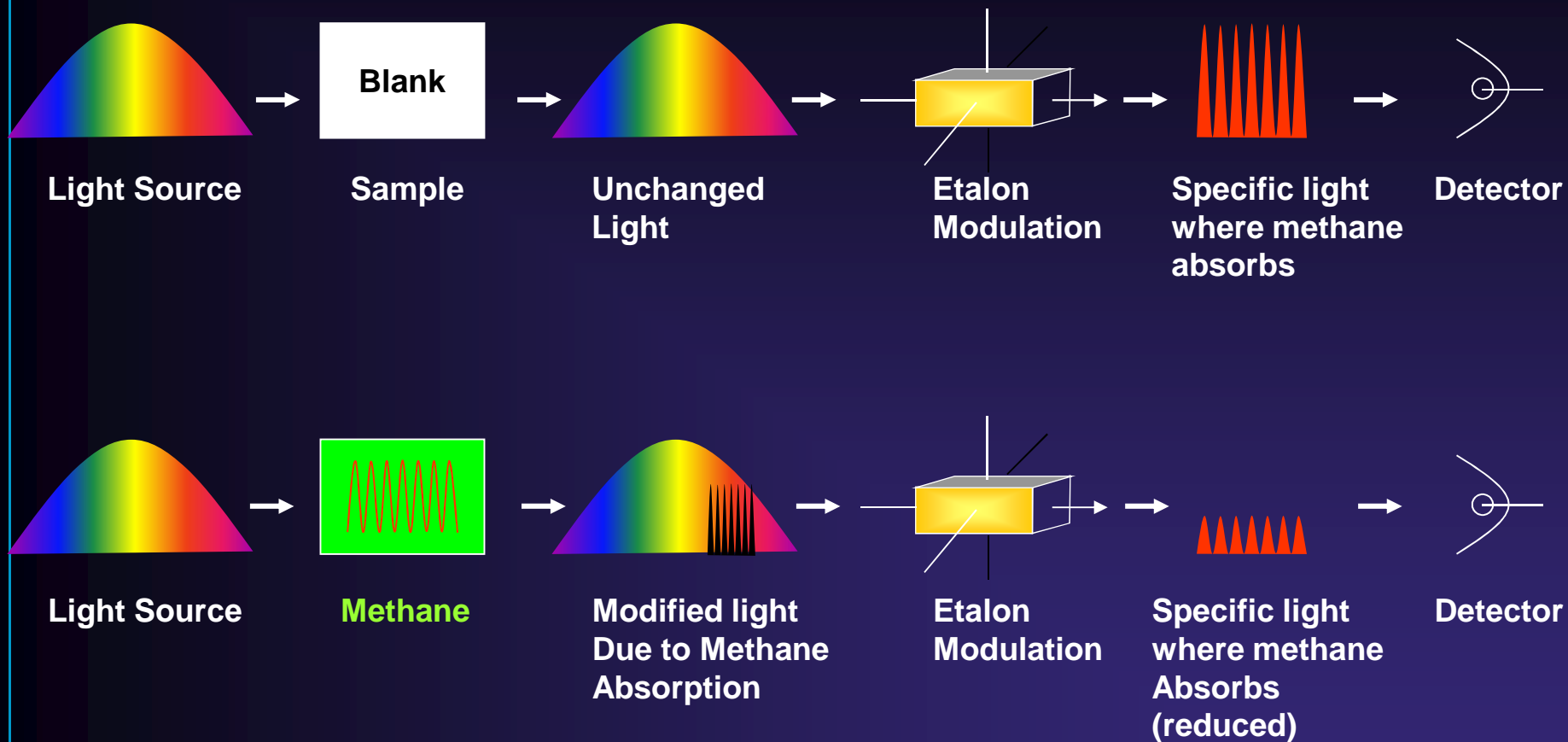
IR Absorption of Methane (High Resolution)



Absorption (%)



Specific Methane Sensing via Etalon Technology

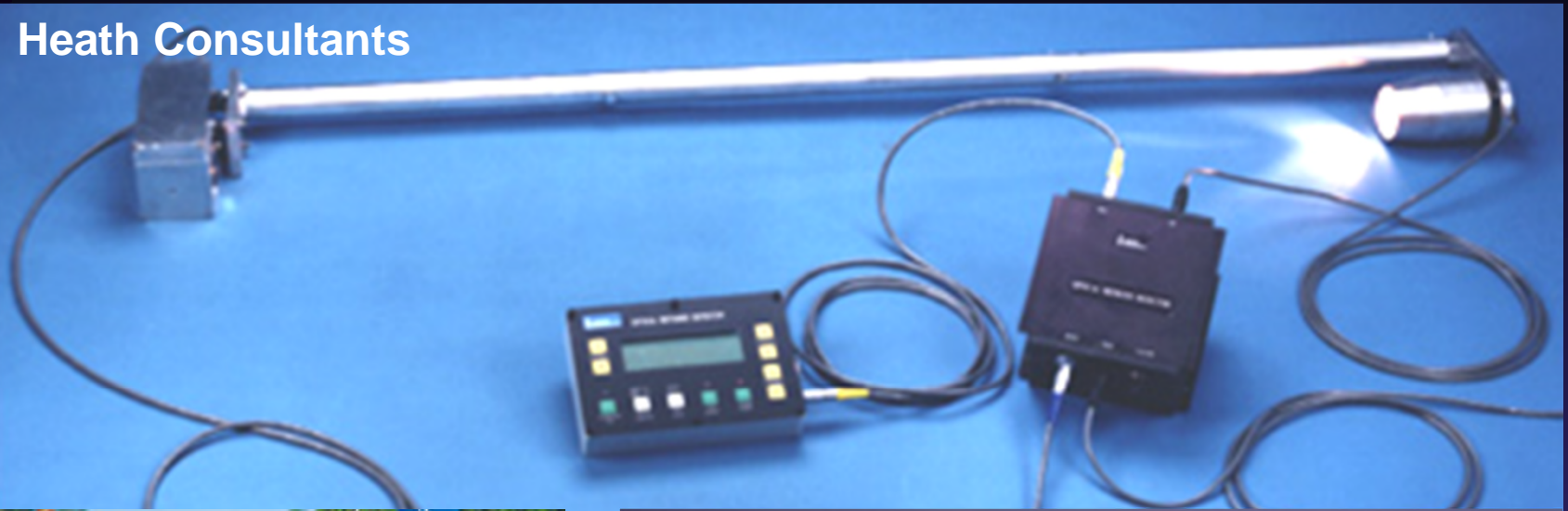


Etalon Technology

- High specificity to methane detection
- High sensitivity
- No or minimal interference
- Quantitative
- Rapid detection
- No moving part
- Internal and automatic calibration possible
- Diagnostics implemented

Optical Methane Detection (OMD) via Etalon

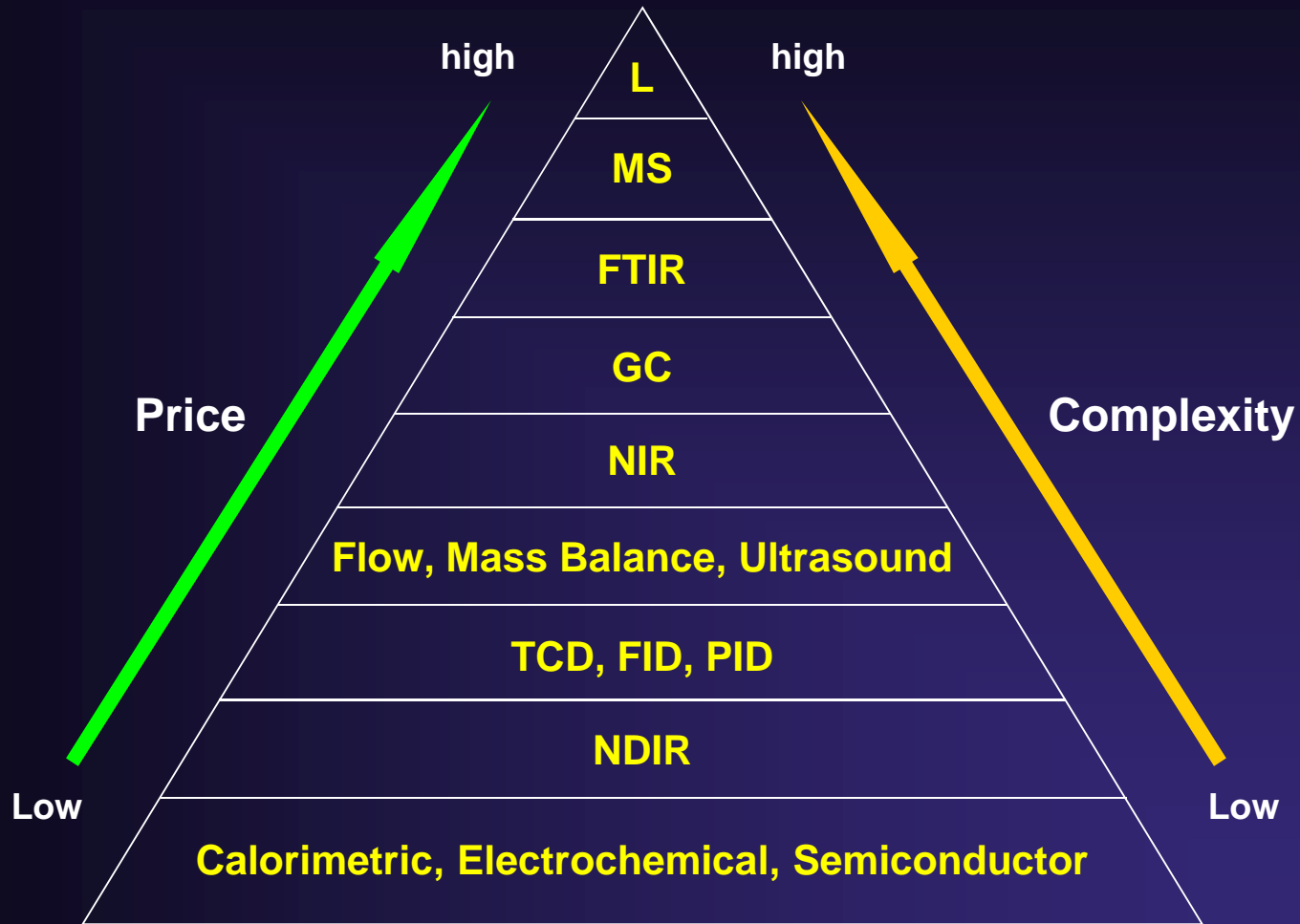
Heath Consultants



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Technology in the Field Applications, e.g.



Development Considerations

- Price range
- ROI
- Threshold detector vs Analytical measurement
- Quantitative
- Accuracy (standard?), repeatability
- Response/recovery time
- Size
- Specificity
- MTTF
- MTTR
- Humidity
- Temperature
- Interference

Development Considerations

- Threshold alarm -local (visual, audible), or remote
- False positives/False negatives
- Communication- wireless, GPS
- Diagnostic alarm- local (visual, audible) or remote
- Self validation
- Sample delivery, conditioning
- Calibration (simple, ease, economical, repeatable, traceable)
- Power
- Utilities
- Protection (flame proof, intrinsic, purged, increased safety)
- Classification and Certification