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If you require assistance in obtaining access to the presentations, call the Public Affairs Office at (916) 341-6300 or Dennis Corcoran at (916) 341-6395.

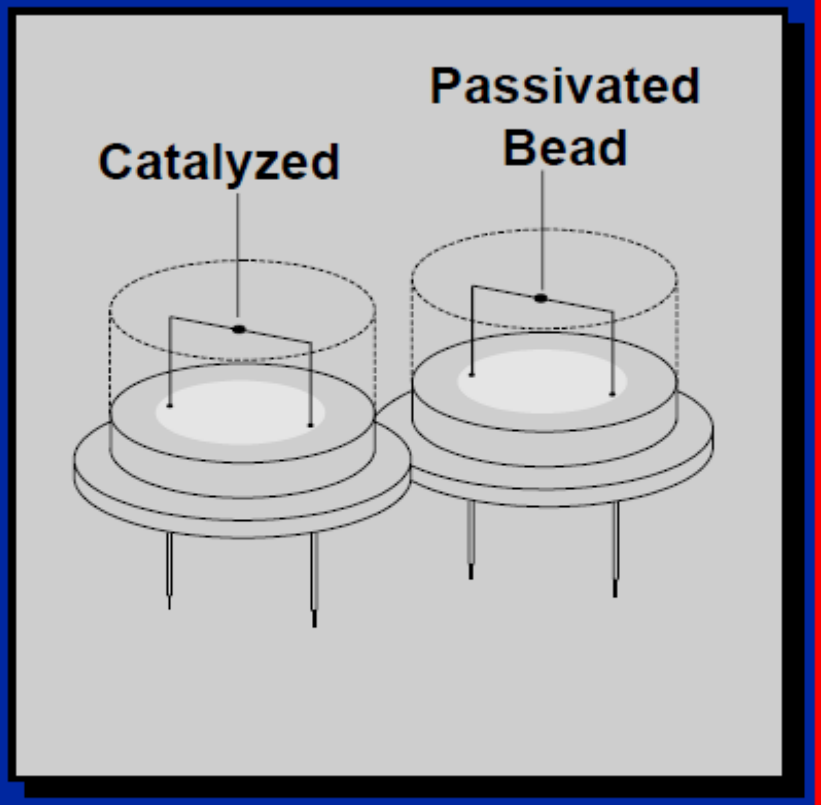
Landfill Gas Monitoring Equipment

Sensor Technology

- Catalytic Bead
- Electrochemical
- Semiconductor
- Infrared

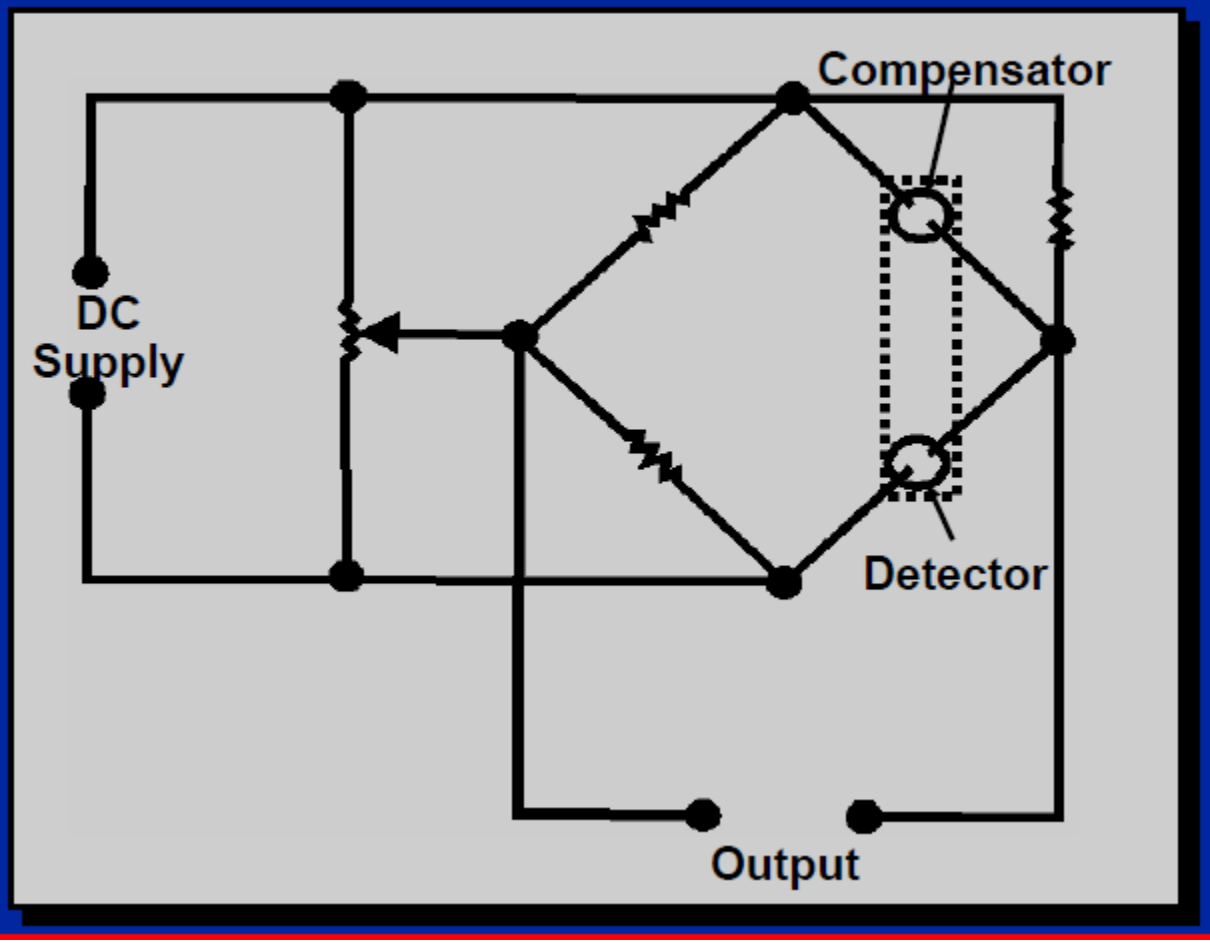
Catalytic Bead

- Wheatstone Bridge
- No Temperature or Humidity Effect
- Silicone Resistant
- 0-100% L.E.L. Scale



Catalytic Bead

Wheatstone Bridge



Advantages and Disadvantages of Catalytic Technology

Advantages:

- Low Cost Technology
- Catalytic Sensors Will Detect A Wide Range Of Gases And Vapors
- Most Catalytic Sensors Are Simple Devices, Apart From Calibration Gas No Special Equipment Is Required For Maintenance

Advantages and Disadvantages of Catalytic Technology

Disadvantages:

- Catalytic Sensors Are Vulnerable To Permanent Poisoning By Silicones, Lead, Sulfurs, or Chlorinated Compounds
- Catalytic Sensors Must Be Operated Behind A Flame Arrestor (Sinter) Which May Become Blocked
- Catalytic Sensors Do Not Fail-Safe, Poisoned Sensors Remain Electrically Operational; The Instrument May Display Zero Even If Gas Is Present

Advantages and Disadvantages of Catalytic Technology

Disadvantages:

- Sensitivity Is Reduced In The Presence Of Some Compounds (notably hydrogen sulfide and halogens)
- Catalytic Sensors Need A Minimum Of 12% Volume Oxygen Present to Operate
- Catalytic Sensor Sensitivity Degrades Over Time

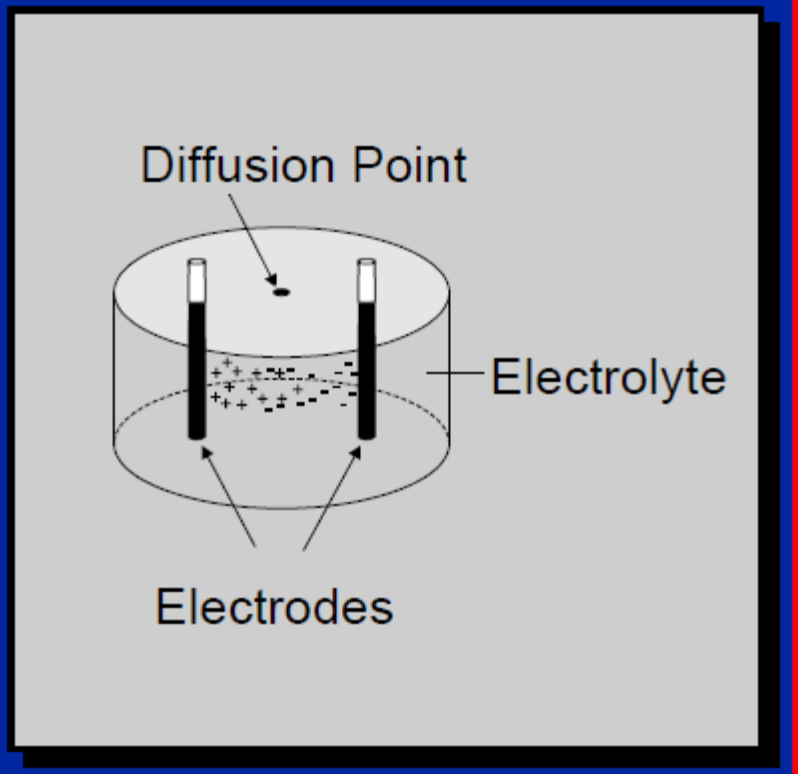
Advantages and Disadvantages of Catalytic Technology

Disadvantages:

- Catalytic Sensors Can Have A Limited Life Span Typically Lasting 3-5 Years
- Catalytic Sensors Require Regular Gas Testing To Ensure They Are Operational, And Regular Calibration To Offset Signal Loss Due To Poisoning Or Contamination

Electrochemical

- Current Generating Electrolytic Reaction
- Specificity to Gas of Interest
- PPM for Toxics or Percent Volume for Oxygen



Advantages and Disadvantages of Electrochemical Technology

Advantages:

- They Can Be Specific To A Particular Gas Or Vapor
- They Are Typically Very Accurate
- They Do Not Get Poisoned
- They Monitor At PPM Levels

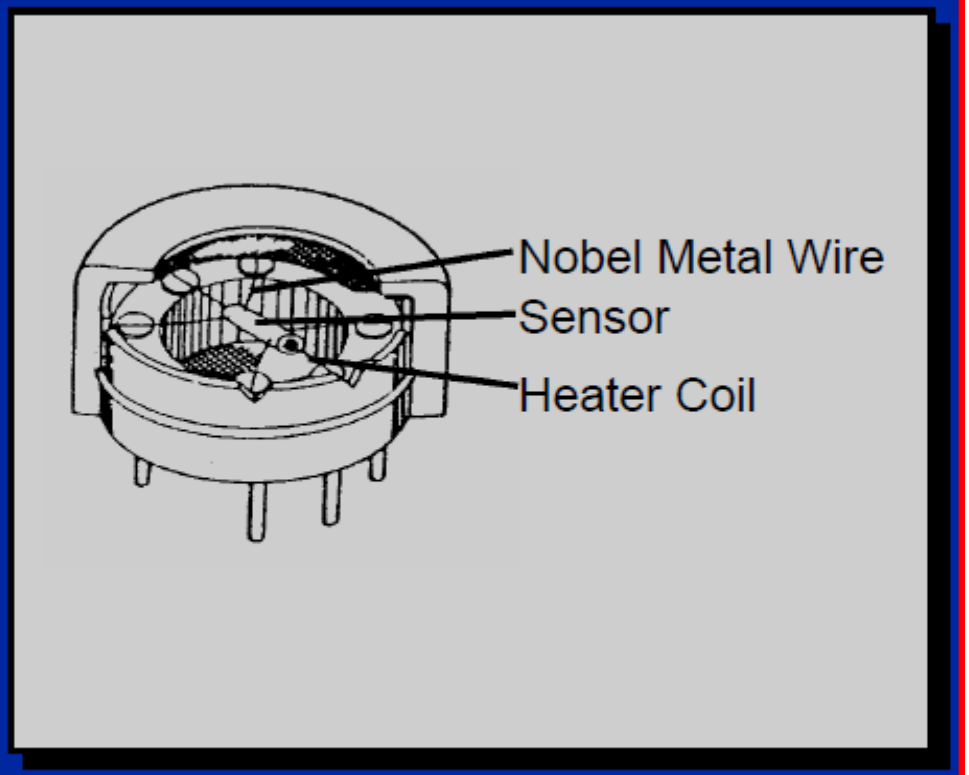
Advantages and Disadvantages of Electrochemical Technology

Disadvantages:

- They Have A Narrow Temperature Range
- They A Short Shelf Life (typically 2 years)
- They Are subject To Several Interfering Gases Such As Hydrogen
- Sensor Lifetime Will Be Shortened In Very Dry And Very Hot Areas

Semiconductor (Solid State)

- Long Life Sensor
- Semiconductor Resistive Film
- PPM Range
- High Sensitivity
- Non-Linear Response



Advantages and Disadvantages of Semiconductor Technology

Advantages:

- Small
- Rugged To Somewhat Rugged
- PPM Sensitive
- Can Be Specific (thin film metal oxide)
- Wide Temperature Range

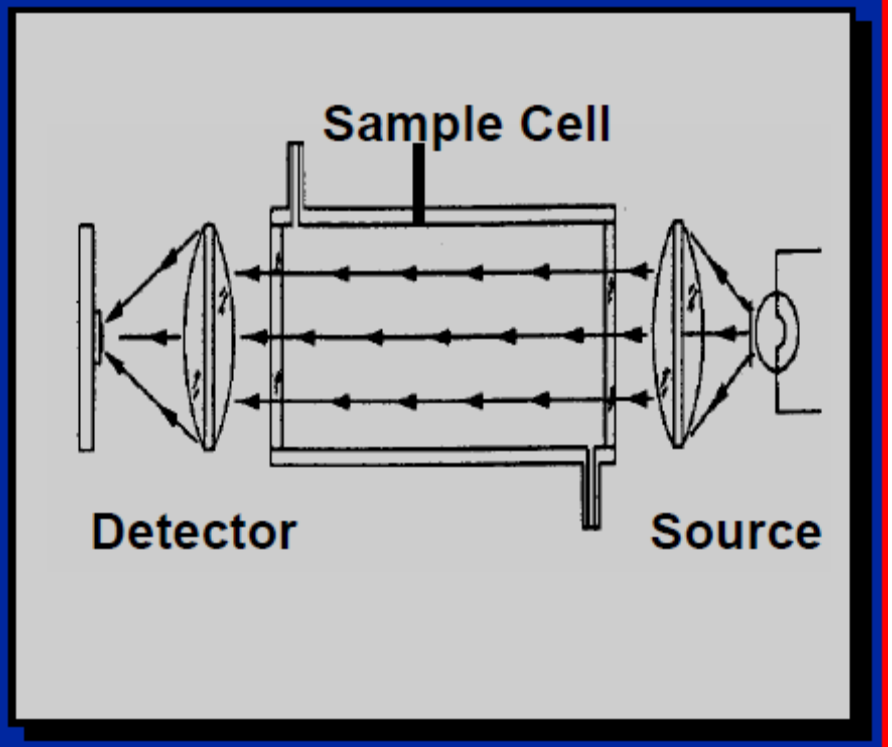
Advantages and Disadvantages of Electrochemical Technology

Disadvantages:

- Sensitive To Humidity
- Some Sensitive To Temperature (tin dioxide), Others Need To Be Temperature Controlled (thin metal oxide)
- Response May Be Slow On Aged Sensors
- Non Specific To Gases And Vapors (tin dioxide)
- Separation In High Vibration Applications

Infrared

- Methane or Propane
- Carbon Dioxide
- Accurate
- Large Measurement Range
- Low Maintenance



Advantages and Disadvantages of Infrared Technology

Advantages:

- Can Be Made Specific To A Particular Gas
- Require Less Calibration Than Other Sensors, There Is No Contact With The Gas
- No Minimum Level Of Oxygen Is Necessary
- Relatively Maintenance-Free

Advantages and Disadvantages of Infrared Technology

Disadvantages:

- They Cannot Monitor All Gases
- They Can Be Affected By Humidity And Water
- They Can Be Expensive
- Dirt Can Coat The Optics And Impair Response

Detection Techniques

Combustible	Catalytic bead, Semiconductor, Infrared
Oxygen	Electrochemical
Toxic Gases	Semiconductor, Electrochemical, Infrared

Choosing A Gas Monitor

While choosing a gas monitor it is very important to make note of the following factors:

- **Reliability**: It is very important to see that the system being used provides reliable results.
- **Maintenance**: Service of your gas monitor is a crucial element of ensuring the continued optimum performance of your equipment.
- **Simplicity:** The gas monitor should be easy to operate as this will ultimately determine the usability of the equipment.