



World Leader In Gas Detection & Sensor Technology

Gas Detection History



Gas Detection History

First Gas Monitors

Canary in a cage

- Canaries are more susceptible than humans to low oxygen, methane gas, or CO gas.
- A passed out canary means a dangerous gas situation.
- Generally two canaries used.



Gas Detection History

Flame Safety Lamp (Davey's Lamp)

- Invented by Sir Humphry Davey (of England) in 1815
- Oil flame adjusted to specific height in fresh air
- Flame contained within a glass sleeve and with a flame arrestor
- High flame means methane gas present
- Low flame means low oxygen





Gas Detection History

Catalytic Combustion (LEL) Sensor

- Developed by Dr. Oliver Johnson 1926-1927
- Working for Standard Oil Co. of CA (now Chevron)
- Need was to prevent explosions in storage tanks on oil and gasoline tankers

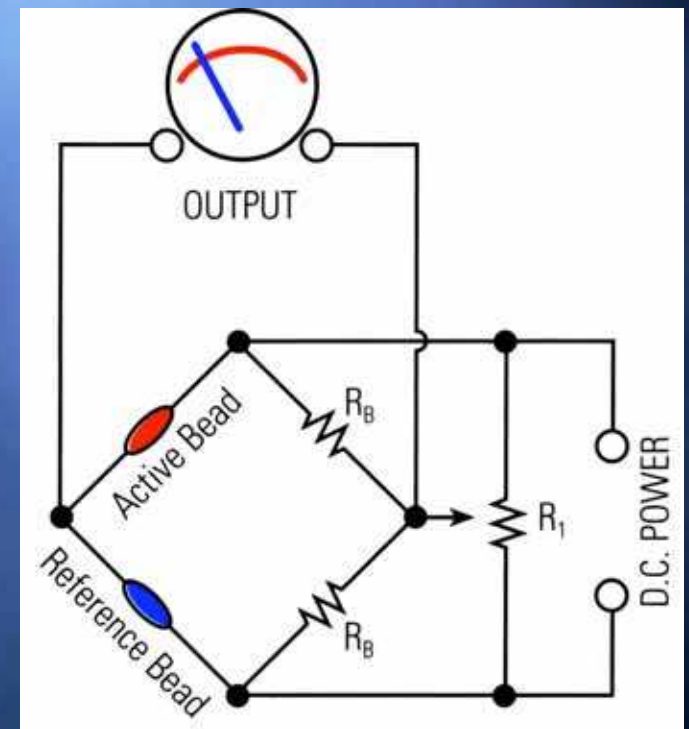


Dr. Oliver Johnson

Gas Detection History

Catalytic Combustion (LEL) Sensor

- Principle : Hot wire catalytic platinum filament oxidizes flammable gases or vapors at lower levels than they would normally oxidize in air.
- Oxidizing gases or vapors cause increase in temperature of hot wires which increases electrical resistance of the wire.
- Second not wire not in gas stream used as a reference filament.
- Resistance change measured with Wheatstone bridge to deflect a meter.



Gas Detection History

Catalytic Combustion (LEL) Sensor

- First instrument Model A demonstrated in 1926 using 2 jar method shown.
- Only one Model A built, for demonstration purposes.





Gas Detection History

Model B LEL Monitor

- 1927 Introduction
- First practical production model of LEL meter (weighs 12 lb)
- Approx. 100 units made
- PG&E used for 50 years
- 2 meters: 1 for gas reading & 1 for sensor voltage (critical adjustment)
- 20 made by Dr. Johnson while at Standard Oil
- Called the “Standard Oil Electric Vapor Indicator”
- Used hand aspirator to draw sample



Gas Detection History

Sensor for Model B

- 2 filaments in a glass tube
- One tube sealed as the reference element
- Instrument remained outside the hazardous area
- Flame arrestor on sample inlet prevented flashback into tested space

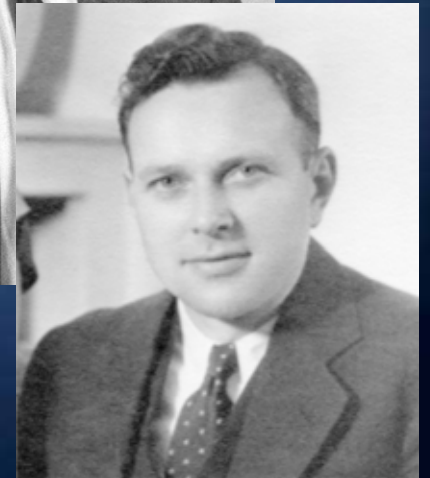




Gas Detection History

Johnson-Williams Instruments

- Formed in 1928, Palo Alto, CA
- Started by Dr. Oliver Johnson & Phil Williams
- Recognized as the first “Electronics” company in “Silicon Valley”
- Trademarked “J-W Sniffer”
- Manufactured 80 more of the Model B J-W indicator



Dr. Oliver Johnson

Gas Detection History

J-W “Sniffer” Model C

- 1929
- Smaller & lighter than Model B
- Approx. 300 units built
- Accepted by US Navy
- Had flame arrestor approval for acetylene use





Gas Detection History

MSA

- 1929/1930 Borrowed J-W Model C for 3 months
- Initially indicated to J-W they may want to sell Model C
- Returned meter with letter; “Does not fit into MSA marketing plans”
- 6 Months later MSA introduced their own LEL meter with same characteristics as Model C
- World’s second gas detection company

Gas Detection History

MSA Explosimeter Model 2A

- 1935 Introduction
- MSA's 2nd design
- Popular rugged unit, still in use today
- Uses 8 D-cell batteries
- Used unbalanced bridge circuit (no reference filament)



Gas Detection History

Interferometer

- 1925-1927
- Dr. Uzumi Doi did initial research in 1927 at the Institute of Physical & Chemical Research in Japan
- Dr. Ziro Tsuji of the Institute developed the first working prototype
- Developed to help prevent explosions on oil tankers, and in coal mines



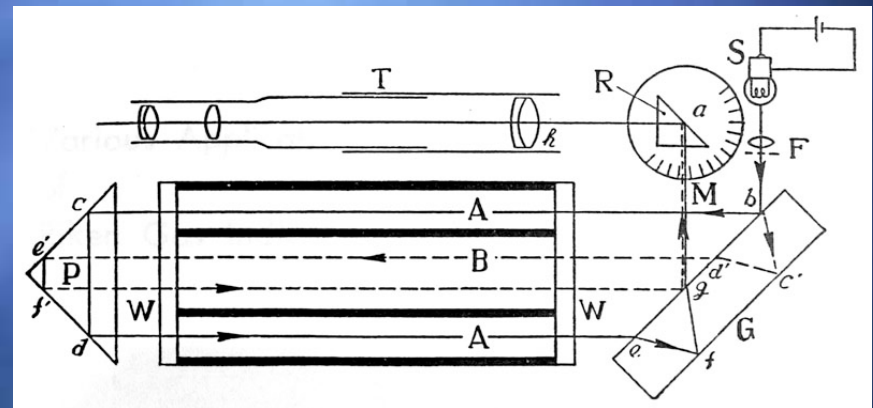
Dr. Tsuji



Gas Detection History

Interferometer

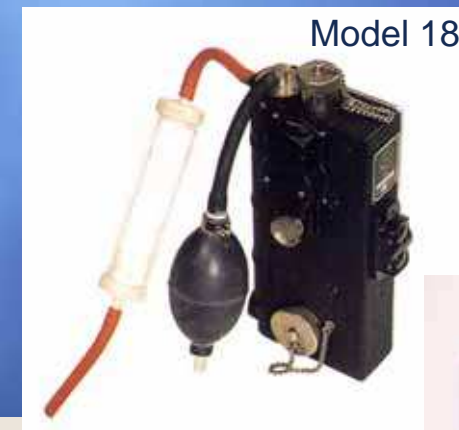
- Uses principle of light diffraction in air to indicate presence of methane or gasoline vapors
- Light diffraction creates visible fringe lines that shift to indicate gas concentration



Gas Detection History

Interferometer (Riken Keiki)

- 1935: 40 units sold to coal mine in Hokkaido
- 1938: Dr Tsuji re-invented, simplified, and started Riken Keiki Co. Ltd. In 1939 to manufacture
- 123 of 365 coal mine explosions in Japan blamed on “Flame Safety Lamp”
- Some versions still sold and in use today





Gas Detection History

J-W Model F

- 1938 – 1955
- Approx. 3,000 units sold
- More compact than model C
- Paint originally green, changed to gray during WW2 due to shortage of green paint
- Used 2 lantern batteries for power
- Aspirator bulb used to draw sample





Gas Detection History

Ken Johnson

- Son of Dr. Oliver Johnson
- Joined J-W in early 1940s
- Pioneered many gas detection products
- Developed revolutionary J-W Model G in 1955



Ken Johnson



Gas Detection History

J-W Model G

- 1955 – 2004
- Smaller & lighter than any other LEL meter
- Aspirator bulb, spring loaded, twisted away from meter, to double as an on/off switch, saving battery power
- Over 20K units sold, many still in use today



Gas Detection History

J-W Model K, Oxygen Monitor

- 1965 Introduction
- World's first portable Oxygen meter using galvanic cell
- Basic sensor concept (Clark Cell) developed by Mr. Clark
- Sensor designed by Mr. Kim of J-W





Gas Detection History

J-W Model GPK, LEL/O₂ Monitor

- 1969: Model GPK introduces first LEL/O₂ portable
- Combines Model G and Model K into one instrument
- World's first combination LEL/O₂ portable monitor

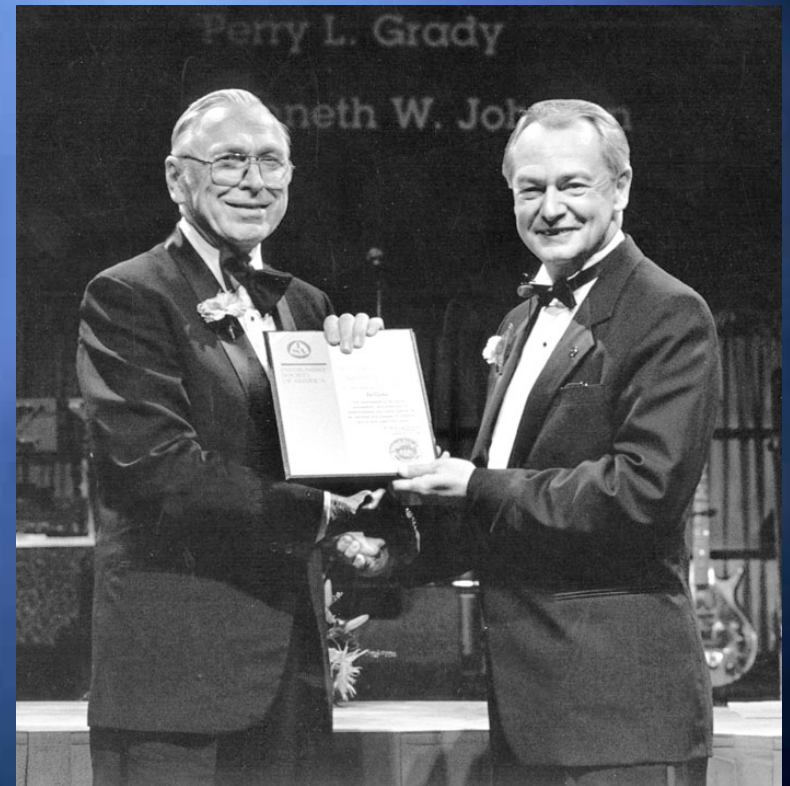




Gas Detection History

Ken Johnson

- J-W sold to Bacharach in 1965. A few year later Ken left and started a new company, Johnson Instrument Division of E.D. Bullard, which became GasTech Inc. in 1971
- Still active with gas detection today (2006) at 84 years old



Ken Johnson



Gas Detection History

Mr. Y. Nakajima, Riken Keiki, Co.

- Met Ken Johnson in 1969
- Together Riken and GasTech created many industry breakthrough instruments in the coming years
- Still president of Riken Keiki today (2006) at 72 years old





Gas Detection History

Riken Model GX-3

- 1970 Introduction
- World's first combustible LEL & oxygen monitor with alarm
- Approx. 12,000 sold
- Used internal pump instead of hand aspirator





Gas Detection History

GasTech GasTechlor

- 1974 Introduction
- “Lunchbox” size
- Extremely popular and many versions available
- Diffusion and sample draw
- Up to 3 sensors
- Sensor extension cable available
- Some versions still made today





Gas Detection History

GasTech Model - ProtecTor

- 1975 Introduction
- World's first belt worn diffusion LEL/O₂ monitor with alarm
- Used an extender cable to remote the sensors for testing manholes





Gas Detection History

Riken/GasTech Model 1641

- 1979 Introduction
- World's first 3 gas portable with alarm
- LEL/O₂/H₂S or CO
- Idea and prototype made by GasTech
- Redesigned & manufactured by Riken Keiki for GasTech





Gas Detection History

Riken Model HS-82 / CO-82 / OX-82 / GP-82

- 1982 Introduction
- First belt worn portable gas monitor for toxic gases
- Extremely popular unit
- Available for LEL, O₂, H₂S, or CO





Gas Detection History

Riken Model GX-82

- 1982 Introduction
- Revolutionary instrument dominated market for many years
- Worlds first 3 gas belt worn unit with alarm
- Extender cable for sensors available
- LEL/O₂/H₂S or CO
- Still sold today





Gas Detection History

Riken Model GX-86

- 1986 Introduction
- World's first 4 gas belt worn portable unit
- LEL/O₂/CO/H₂S
- Extender cable for sensors available
- Dominated market for many years
- Still sold today





Gas Detection History

Other Gas Detection Milestones

- 1968, Taguchi (Figaro) metal oxide sensors: Introduction of this new technology sensor type permitted low cost detection of many gases and vapors
- 1969 EC Sensor Ecolyzer: Pioneered development of electrochemical sensors and gas monitors
- ~1985, City Technology: Developed Oxygen and other EC sensors for toxic gases, sold to general industry. This spawned dozens of gas detector companies in late 1980s and 1990s



Gas Detection History

Other Gas Detection Milestones

- Current strong players: Riken/RKI, MSA, Draeger, ISC, BW, Scott/Bacharach, Biosystems, Thermo, Zelwegger (Neotronics/Lumidor), Rae Systems
- 1982-85 Paper tape. Early 80s MDA pioneered toxic gas detection using paper tape technologies
- ~1985 PID HNU, Photovac, Rae Systems (1993)



Gas Detection History

RKI / Riken EAGLE

- 1994: Riken Keiki partners with RKI Instruments, Inc., after GasTech sale to Thermo Electron
- 1995 Introduction of RKI Model EAGLE
- Over 300 versions available
- Continues the “Lunchbox” type gas monitor
- Up to 6 gases





Gas Detection History

RKI / Riken Current Milestones

- 2000: World's first watch type portable gas monitor
- 2001: World's smallest 4 gas monitor (LEL/02/H2S/CO)

