

CWD 2008 Conference
19 – 22 May 2008, Interlaken, Switzerland

Development of a Miosis Detection System (LCD4)

Presentation by: Derek Broadbent- Capabilities Manager





Introduction to Smiths Detection



Introduction to Lightweight Chemical Detector



Principle of Operation LCD4



Summary



Introduction to Smiths Detection



Introduction to Lightweight Chemical Detector



Principle of Operation LCD4



Summary

Smiths Group: Operating in three sectors. Each with a strong growth profile

Smiths Detection - sales £438m



Equipment for homeland defence business security and protection of the military

Smiths Medical - sales £691m



Specialist devices and equipment for critical healthcare

Specialty Engineering - sales £1,032m



Application-specific components for energy, defence & communications markets

- Sales 2007: £2,161m
- Listed on London Stock Exchange
- Member of FTSE 100 largest UK companies
- Founded 1851
- 20,000 employees in over 50 countries
- Chief Executive – Philip Bowman

A world leader in the practical application of advanced technologies.
Making the world safer, healthier and more productive

Development of a Miosis Detection System (LCD4)



Introduction To Smiths Detection



Introduction to Lightweight Chemical Detector



Principle of Operation LCD4



Summary

Development of a Miosis Detection System (LCD4)

- Smiths Detection are a world leader in the development and manufacture of chemical detection systems.
- LCD3 (Lightweight Chemical Detector) series of detectors.
- Non-radioactive corona discharge system as the ionisation system.
- miniIMS technology integrated into a miosis detection system LCD4
- Provides detection sensitivities a factor of 100 lower than personal detector
- Significant enhancements in false alarm rejection.



Development of a Miosis Detection System (LCD4)

- Each LCD series version uses the same core non-rad mini-IMS detector module.
- LCD3 - proven in extensive military testing in the U.S. and UK.
- Smiths Detections' new high performance LCD3.3 personal detector is at the heart of the LCD4 miosis detection system.



Development of a Miosis Detection System (LCD4)

- **LCD4 Miosis Detection System** - fast response, low false alarm rate chemical agent detector. A high performance, high sensitivity portable miosis detection system.
- One core ammonia doped system combines with an additional LCD detector unit.
- Additional unit operating on acetone chemistry.
- “dual dopant” approach provides significant enhancements in selectivity.
- Each detector is fitted with two mini-pre-concentrators (one for each IMS cell).
- Achieves unequalled detection sensitivity.
- Two LCD units are combined together in a Platform Interface Kit (PIK) to form the LCD4 Miosis Detection System.



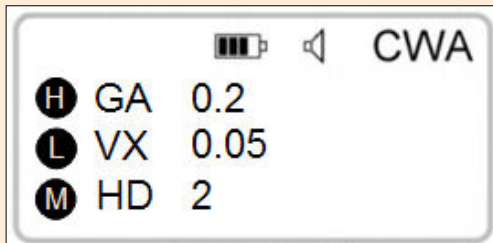
Development of a Miosis Detection System (LCD4)

- LCD3.3 - low-profile personal detector worn on soldiers' Load Bearing Equipment (LBE) and survey instrument.
- LCD4 - enhanced performance, all detection characteristics of the LCD3.3 are preserved.
- LCD4 detects all the Increment II JCAD threshold agents, plus VX_R and CG.
- LCD4 meets the Increment II JCAD Accumulated Dosage Alarm Thresholds.
- LCD 4 - a freestanding man portable detector, or deployed to fixed and mobile platforms.
- LCD3.3 - volume less than 30in³ (492 cm³) weighs less than 1.5 lb (0.65 kg) with batteries.
- LCD4 Miosis Detection System - volume of 419in³ and weighs 7.9lbs (3.6kg).



Development of a Miosis Detection System (LCD4)

- A liquid crystal display shows agent identification.



- The “cell phone like” User interface.
- Programmable with TIC libraries.
- Additional Detection algorithms are available.
- The LCD4 is fully operational within 1 minute.
- Built in Test Equipment (BITE) provides alerts for battery and sieve pack life.

TIC
Hydrogen Sulphide
Hydrogen Chloride
Hydrogen Fluoride
Hydrogen Bromide
Chlorine
Sulphur Dioxide
Phosgene

Development of a Miosis Detection System (LCD4)

- BATTERY & POWER:
 - Lithium Ion Disulphide AA batteries, or Alkaline Manganese Dioxide AA batteries.
 - AA Rechargeable batteries can be used.
 - Battery lifetimes of up to 100 hours. *
- Consumable sieve pack in LCD3 has an ensemble life of not less than 250 hours.
- LCD4 has input/output port(s) for the following:
 - Earpiece output
 - 8-32Vdc Power input
 - RS232/RS485 data out.
- The LCD4 system has been designed to withstand stresses and shocks iaw MIL-STD 810F.



Introduction to Smiths Detection



Introduction to Lightweight Chemical Detector



Principle of Operation LCD4



Summary

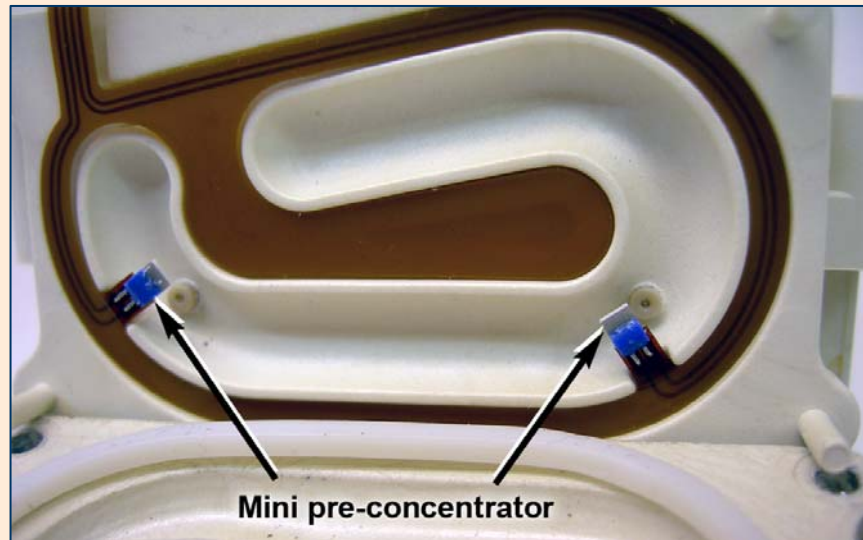
Development of a Miosis Detection System (LCD4)

- Provide miosis detection by increasing sensitivity:
 - Miniature Pre-concentrators
- To achieve deployable miosis detection however, increasing sensitivity alone is not enough.
- It must be linked with improved selectivity:
 - Multi-dopants
 - Advanced algorithms



Pre-concentration

- Mini pre-concentrators mounted in inlet tract
 - Silicone coated PRTs (Platinum Resistance Thermometer)
- Concentrates chemical agent vapour for 10 minutes
- Pre-concentrators heated rapidly to desorb sample close to pinholes (approx 140°C)
- Sensitivity increased by approximately 100-times



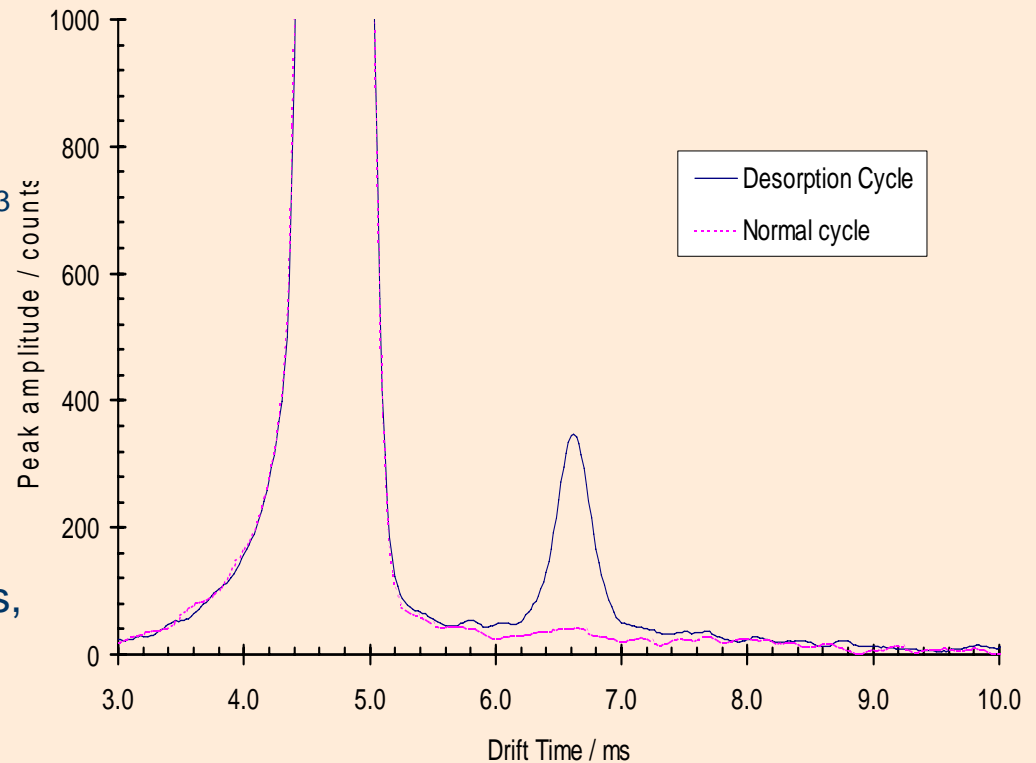
Pre-concentration

Experimental

- 10 minutes sampling time
- Desorption at approximately 140°C
- DMMP vapour at 0.001mgm⁻³

Results

- Normal cycle peak below the noise
- Desorption peak = 380 counts, well above noise threshold



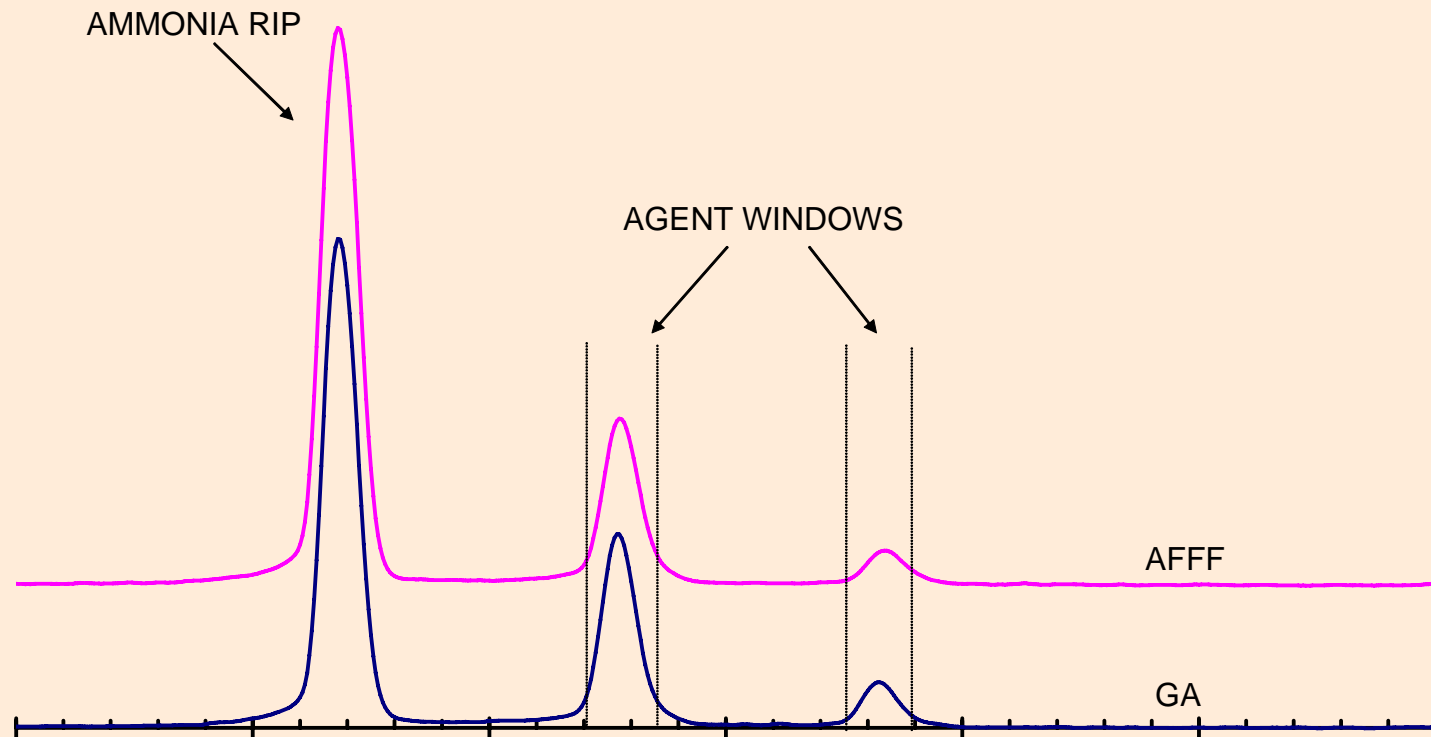
Development of a Miosis Detection System (LCD4)

- LCD4 uses multi dopants to achieve the selectivity enhancement needed.
- Ammonia doped LCD3.3 personal detector combines with an additional LCD detector unit, operating on acetone chemistry.
- The different ion chemistries result in different ion peaks in the ion mobility spectra.
- Combining the information from spectra of both ion chemistries allows discrimination.
- A dual dopant system can discriminate between the interferent and the agent. Thus minimising false alarms.

Development of a Miosis Detection System (LCD4)

Dual Dopant - Example (Part 1)

- AFFF is an interferent for GA in a standard LCD3.3 ammonia doped system



Development of a Miosis Detection System (LCD4)

Dual Dopant - Example (Part 2)

- AFFF is not an interferent for GA in acetone doped system





Introduction to Smiths Detection



Introduction to Lightweight Chemical Detector



Principle of Operation LCD4



Summary

Development of a Miosis Detection System (LCD4)

The use of these technical advances, together with Smiths Detection's experience in the development of robust and reliable fieldable chemical detection equipment, position the LCD4 as a "state of the art" detector with unrivalled performance.

