Road Ahead...

- Integration of Benzene SAP S&D Operations
- Segregation of LRC Functions for MEG and Benzene Loading for sustained S&D SAP Operations.
- Model sharing with other IOCL locations for Direct Mass Flow Meter Deliveries through SAP. “Under Implementation by IOCL – CO(IS)”
- SAP LRC Interface to coordinate matching of Tank & Loading Data Automatically.

References & Acknowledgements

- SAP LRC Direct Interface Protocol Version 4_1 developed by CO-IS IOCL.
- 9971-03-04-01 Functional Specifications Advanced Systek.
- IOCL Corporate BD Group
- IOCL (BD) – PPMC Group.
- IOCL (CO-IS) – Engineering Group.
- AST – Software Engineering Group.

Thank You...

Presented By:-
Sudhanshu Shekhar, Senior Manager Instrumentation
Vikrant Kumar, Dy. Manager Instrumentation

Panipat Naphtha Cracker Complex

AMETEK®
PROCESS INSTRUMENTS

CLEAR VISION SOUND STRATEGIES SOLID PERFORMANCE

AMETEK Process Instruments

Ambient Air Monitoring by Membrane Inlet Mass Spectrometry (MIMS)

AGENDA

- Introduction to Ametek
- Gas analysis mass spectrometry
  - Why use MS
  - Basic theory
- Process MS environmental monitoring
- Typical applications
- Summary

AMETEK

- **Over 2.4 billion US Dollar in annual sales**
- **Employs 11.000 people worldwide**
- **Operates 60 manufacturing plants and 60 sales & service centers worldwide**
- **AMETEK India established in 2009**
  - **150+ Employees working in India**
  - **Head office in Bangalore**
  - **Further offices in Mumbai , Chennai , Delhi**
- **Listed on the New York Stock Exchange since 1930**
- **Two operating groups**
  - **Electronic Instruments**
  - **Electromechanical**

AMETEK Process Instruments

- **Three Factories**
  - Pittsburgh
  - Newark
  - Calgary , Canada
  - International office and distributor network
- **Dycor**
  - Vacuum RGA
  - Laboratory and Process MS
- **Western Research**
  - Hydrogen sulfide & sulfur analyzers
  - Hydrocarbon dew point
  - UV-NIR photometric analyzers
- **Moisture Analayzers**
- **Thermox**
  - Flue gas analyzers
  - Trace oxygen analyzers
  - Trace moisture analyzers
  - WI analyzers

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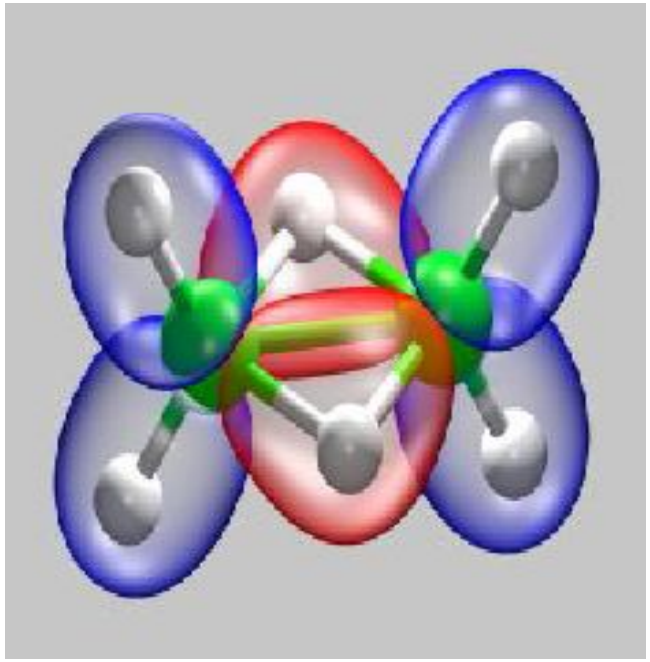
Why to use Process MS ?



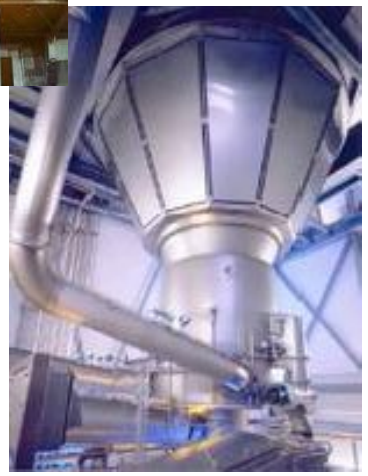
- Speed
- Precision & accuracy
- Multi-component
- Flexibility
- Wide dynamic range
- Multi-stream

Where to us Process MS ?

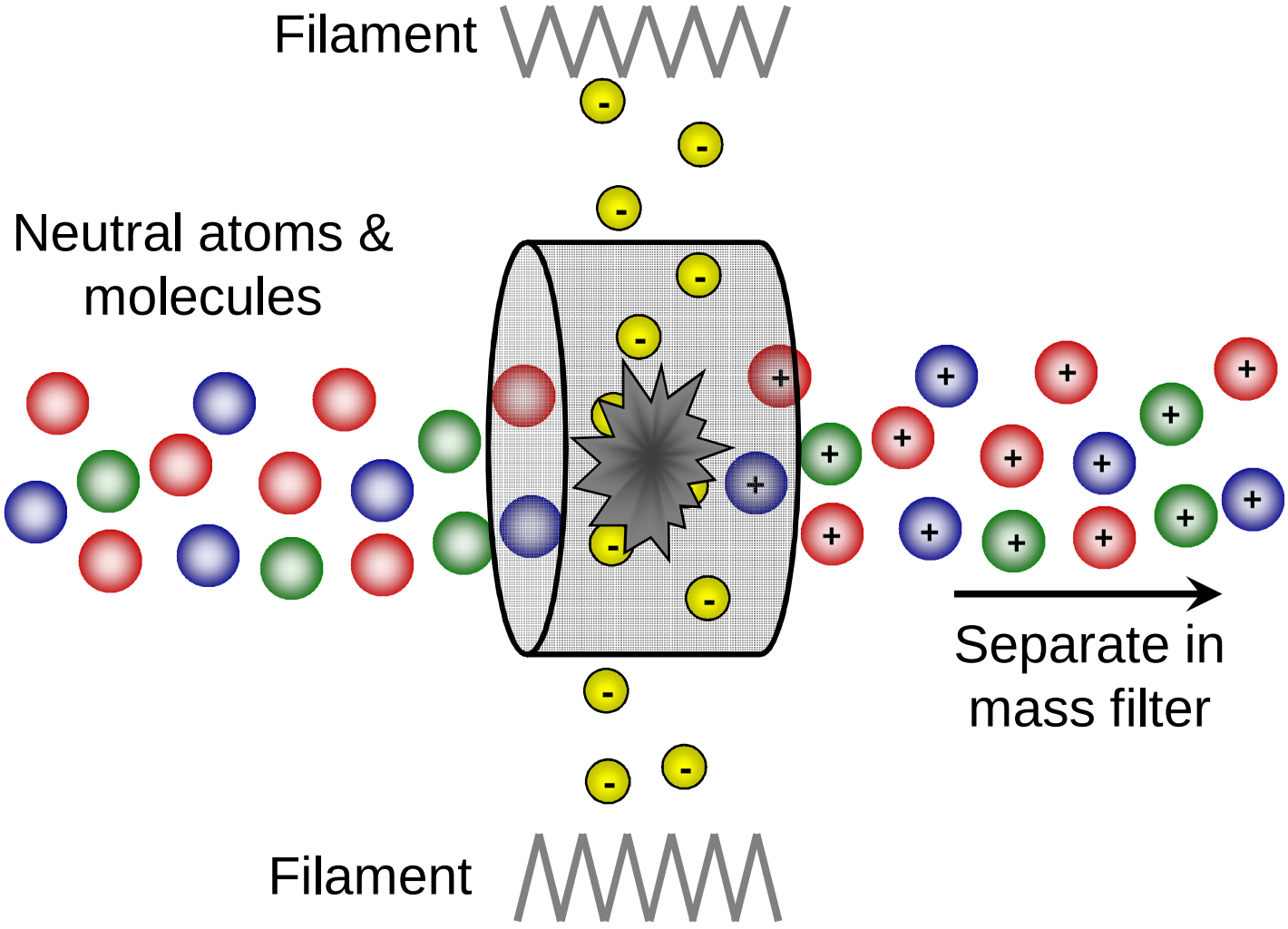
- Iron & steel
- Biotechnology & pharmaceuticals
- Petrochemicals & chemicals
- Refineries (Oil & Gas)
- Environmental monitoring
- Process research



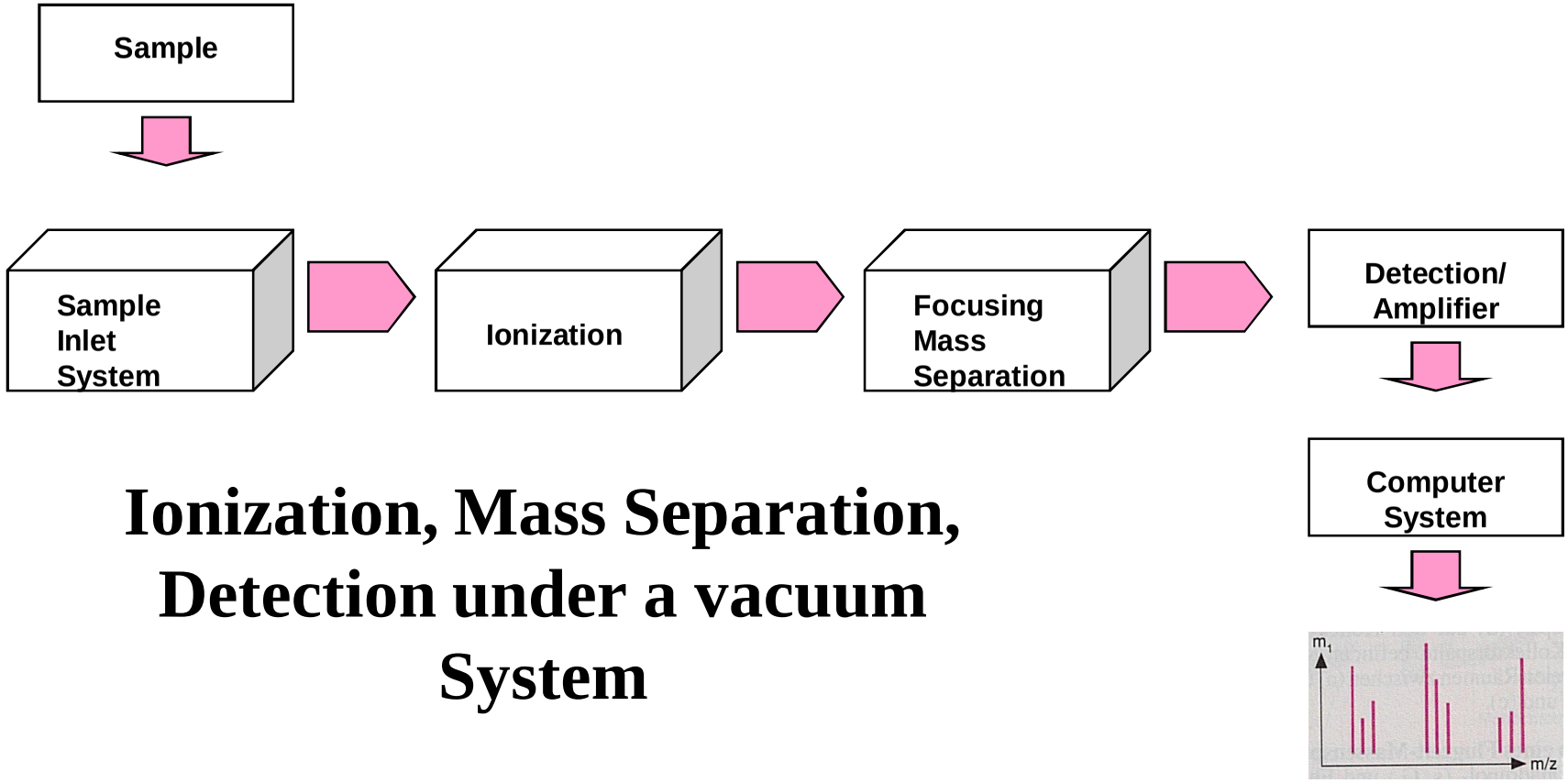




Mass Spectrometer Ionizing Technology



Mass Spectrometer Overview



Ionization, Mass Separation, Detection under a vacuum System

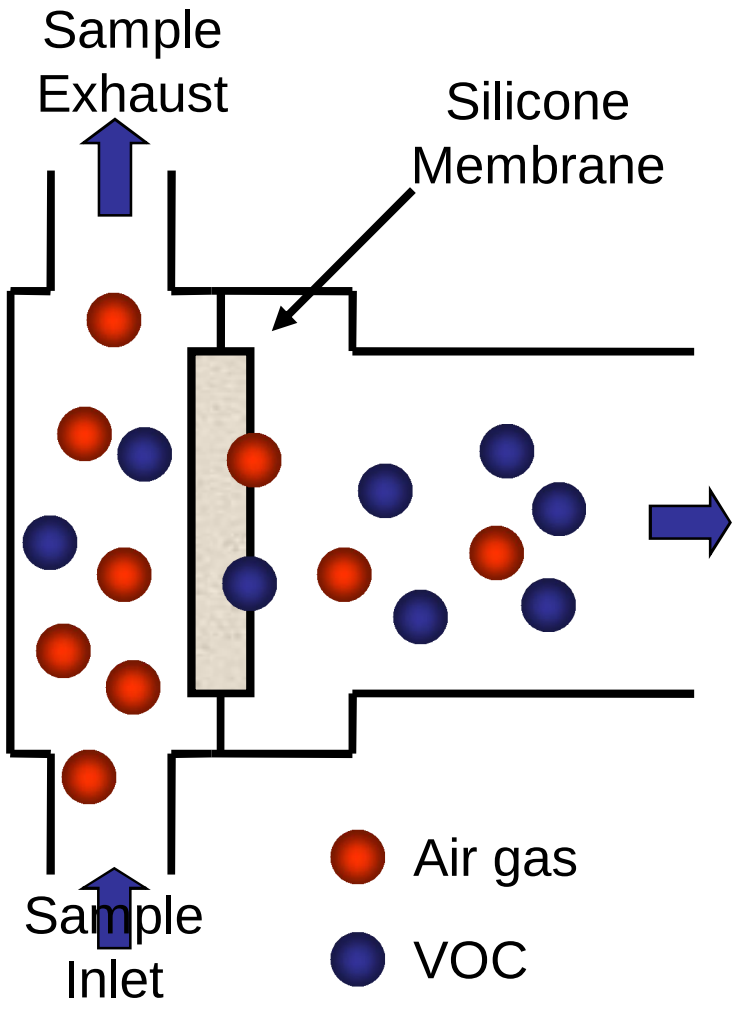
Oil and Gas ; Petrochemical Environmental Applications

Low Level Detection of BTEX and VOC's / EDC's

A challenge ?

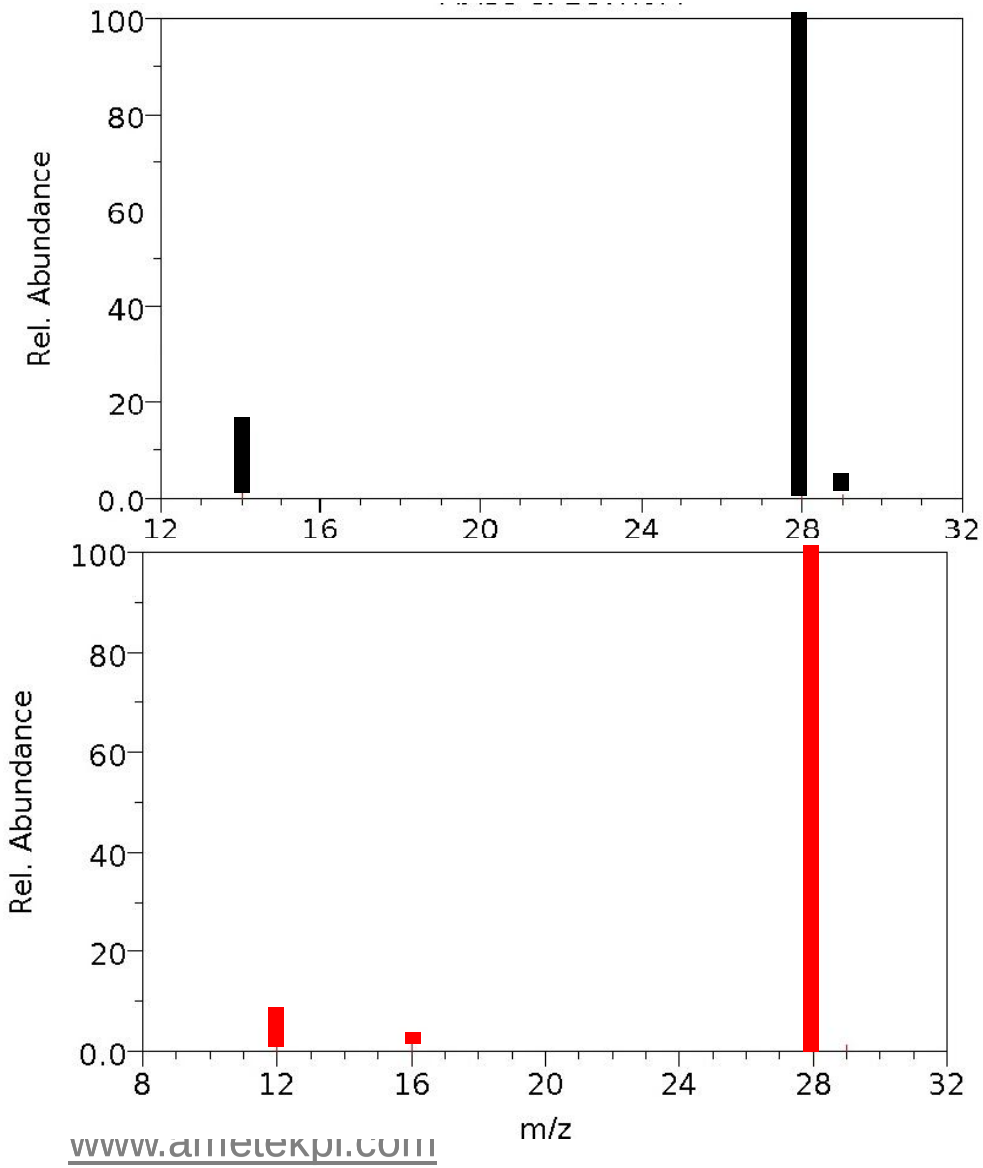
How can it be done ?

Membrane Inlet Mass Spectrometry a proven Solution



- Silicone membrane shows strong preference for organic molecules over N_2, O_2
- Membrane provides selective enrichment and high signal/noise
- Membrane Inlet MS is method of choice for low level detection

Mass Spectra – 'Fingerprints'

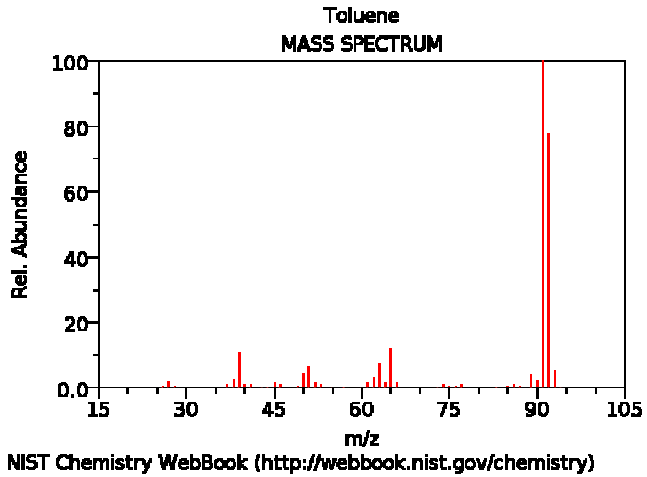


Nitrogen, N_2
MW 28
Fragments:
$N_2^+(28)$, $N^+(14)$,
$N_{15}N_{14}^+(29)$

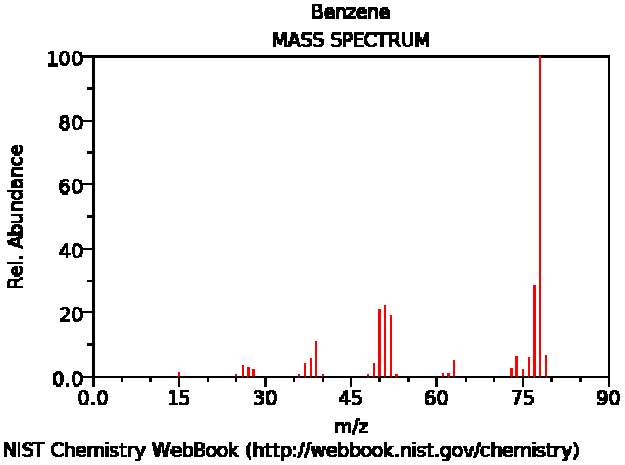
Carbon Monoxide, CO
MW 28
Fragments:
$CO^+(28)$, $C^+(12)$, $O^+(16)$

Source: NIST chemistry webbook
http://webbook.nist.gov/chemistry/

Example: aromatics



Toluene
C_7H_8
MW 92
Principle peaks 92 ($C_7H_8^+$), 91 ($C_7H_7^+$)



Benzene
C_6H_6
MW 78
Principle peaks 78 ($C_6H_6^+$), 77 ($C_6H_5^+$)

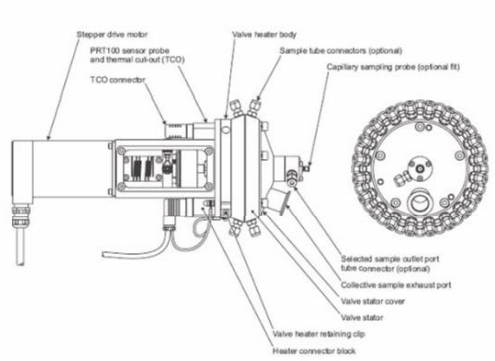
Ambient air ProLine for VOC monitoring

- 100 amu standard, 200 amu option
- Membrane inlet
- 32 sample streams as standard
- Options for 40, 48, 56 and 64 streams
- Typical cycle time 10 seconds per sample point

ProMaxion Process Mass Spectrometer

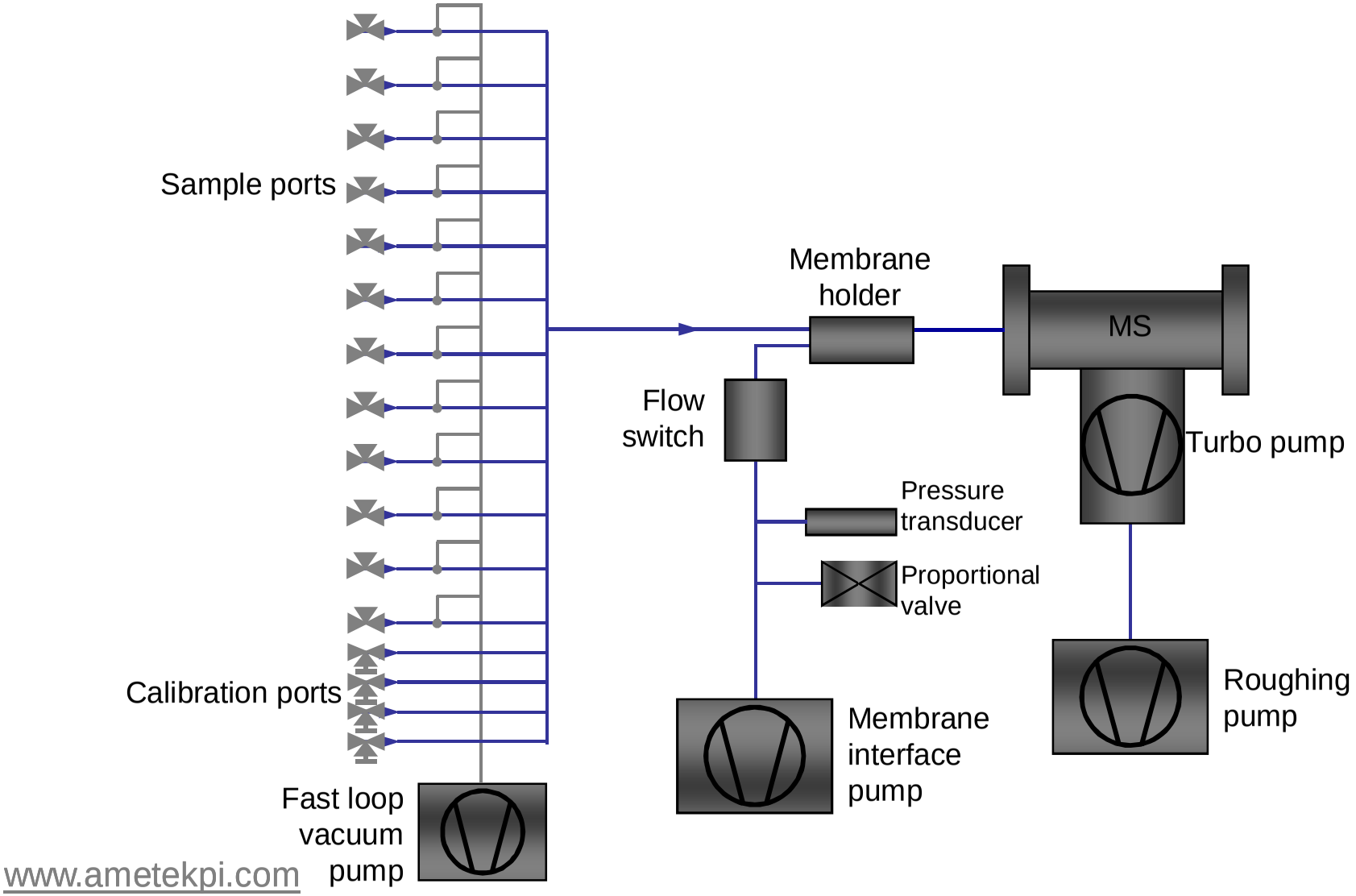
- Process Mass Spectrometer for explosive environments
- Same proven components as in the ProLine
- Suitable for operation directly in the process areas
- High-speed, analyte specific monitoring at multiple points

Rotary Multi-Stream Valve System

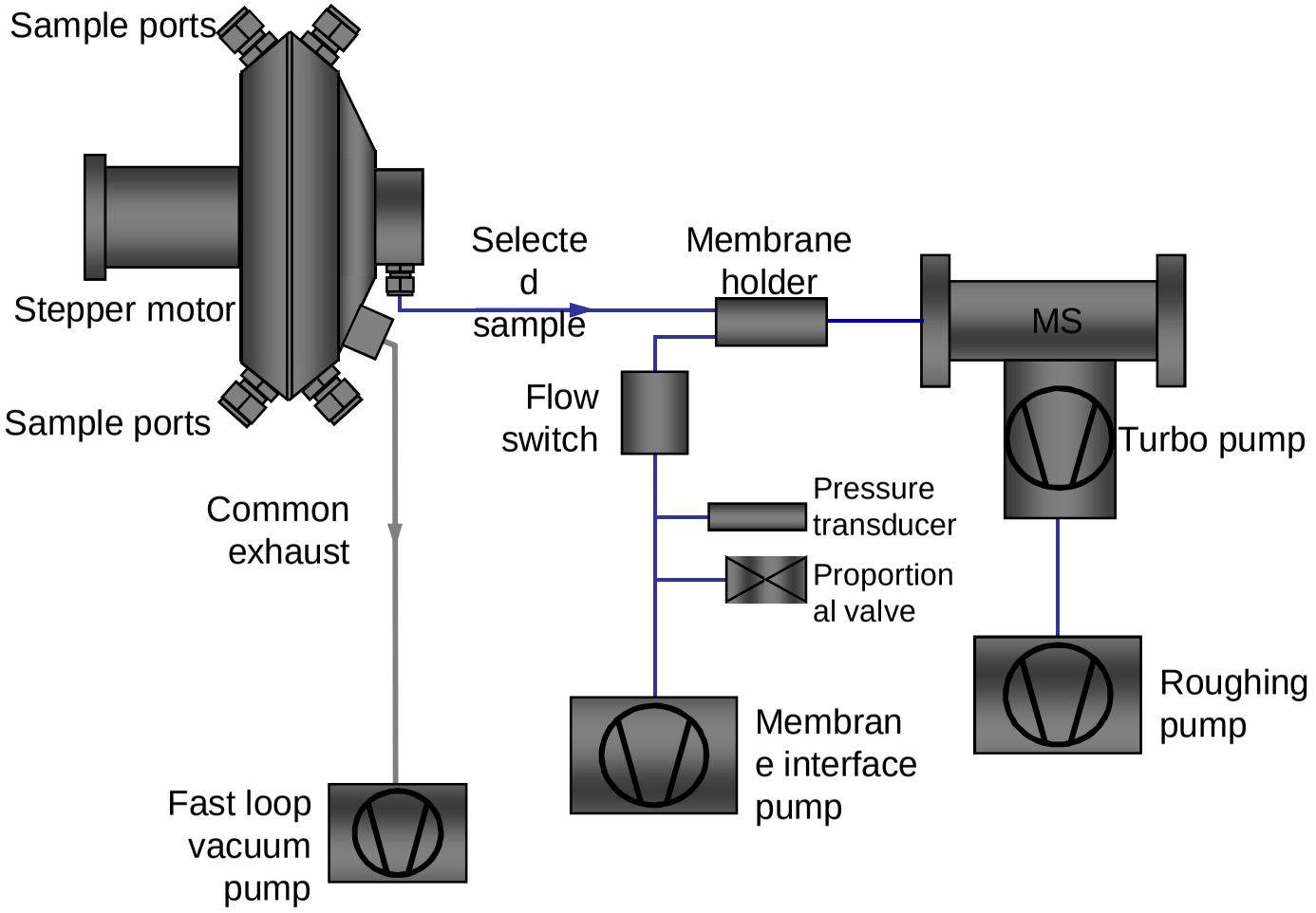


- 40 or 80 port rotary valve system
- Valve system heated up to 120°C
- Gas flow from 0.01 – 10 l / min
- Gas pressure from 10 mbar to 2 bar
- Low dead volume for fast response
- Zero cross-talk for low memory effects

MS Mulit Point Sampling



MS schematic



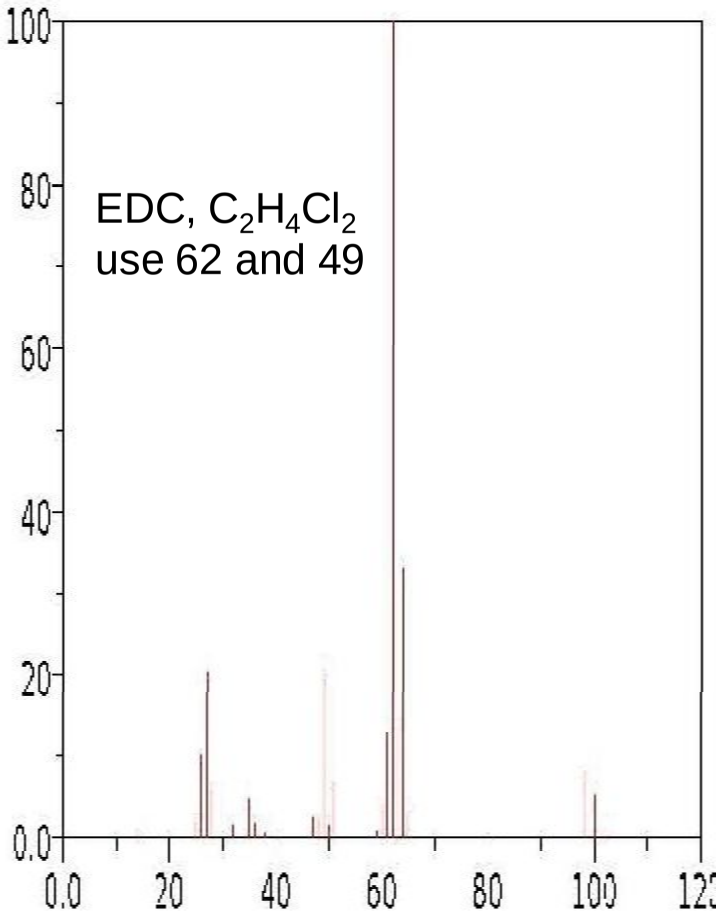
Ambient Air Monitoring by Process MS

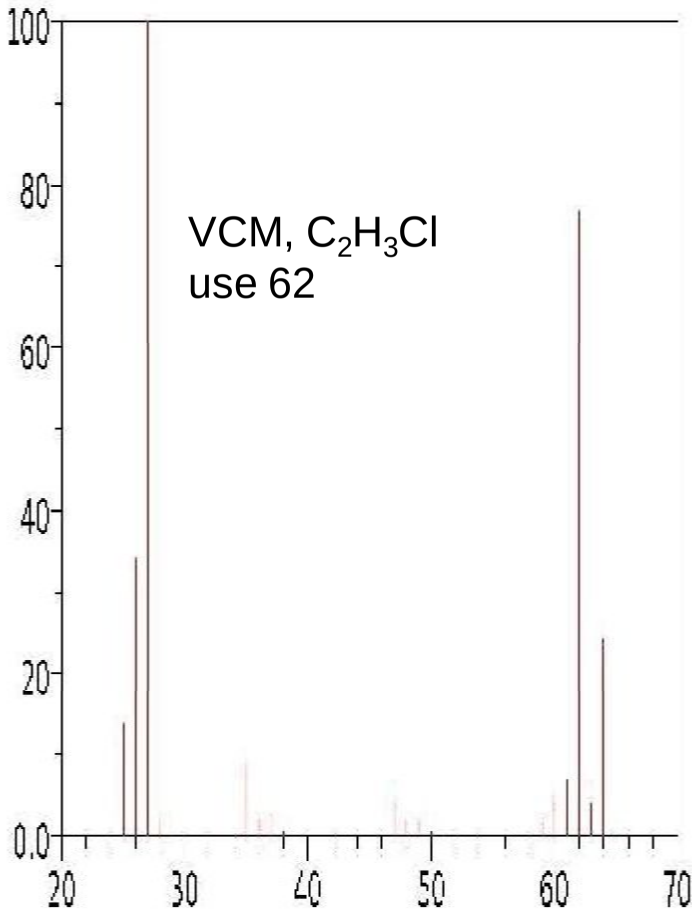
- Detect and quantify harmful process components in air quickly and unambiguously at low levels
- Legal exposure limits typically in the low ppm range
- Sufficiently large confidence factor needed below that (sensitivity)
- Clear identification of compound avoids costly “false alarms”
- Need 24/7 continuous operation

Vinyl Chloride & Ethylene Dichloride

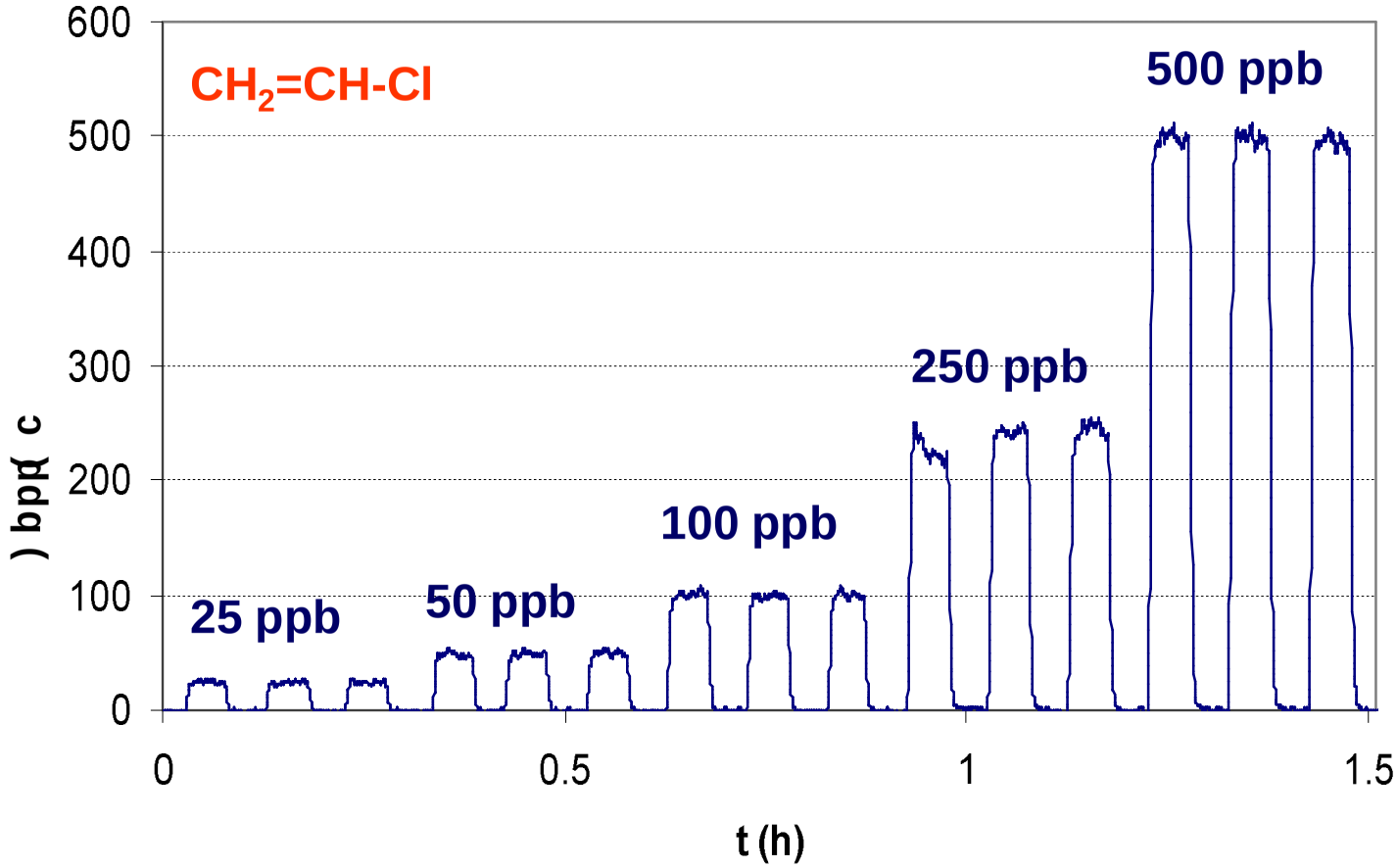
- **Vinyl Chloride monomer (VCM) polymerized to produce PVC**
- **Produced from Ethylene and Hydrogen Chloride**
- **EDC then produces vinyl chloride and hydrogen chloride**
- **VCM and EDC commonly present together in the atmosphere**
- **VCM is a known carcinogen (e.g. liver cancer and leukemia)**
- **OSHA limits (8 hour):**
  - ***VCM: 1 ppm (odour threshold > 4,000 ppm)***
  - ***EDC: 50 ppm***
- ***This can be achieved by Mass Spectroscopy***

Vinyl Chloride & Ethylene Dichloride

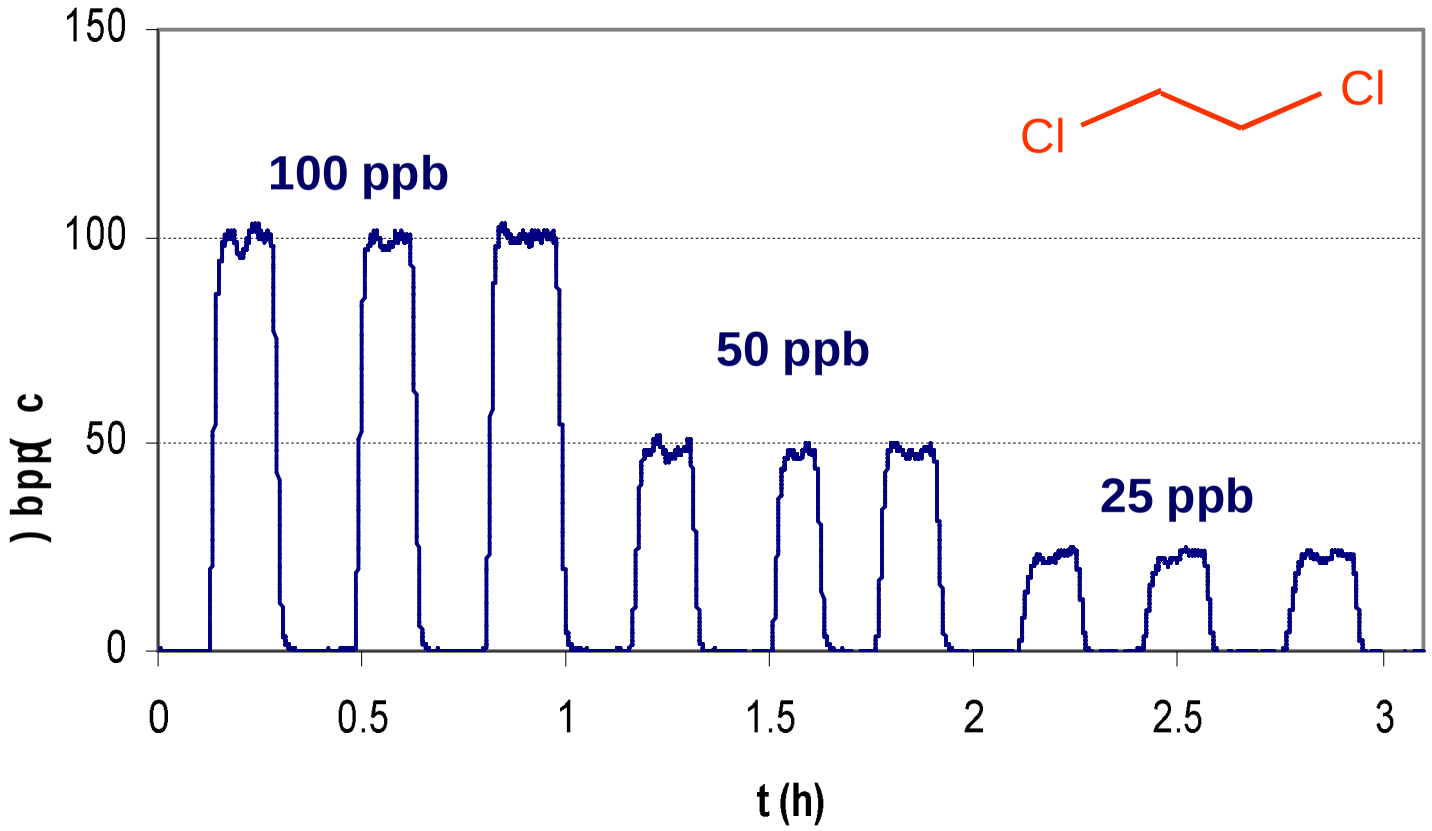




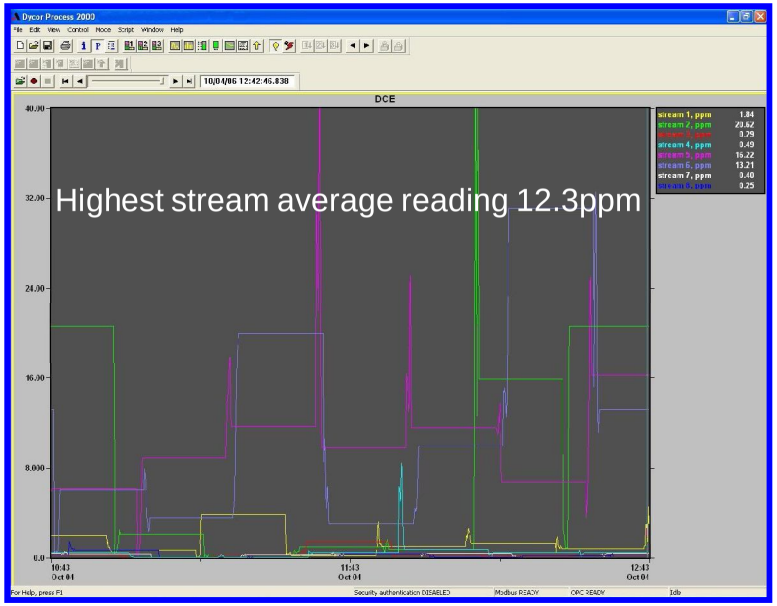
Detection of low levels of VCM



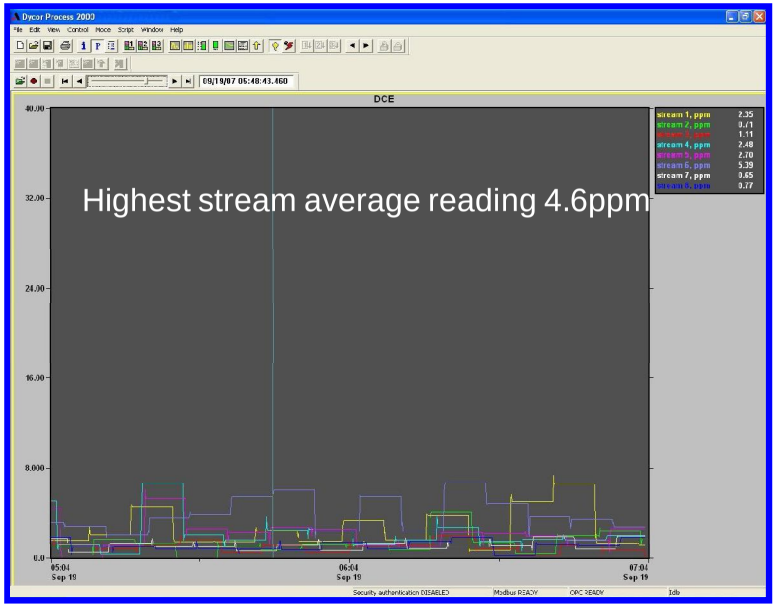
Detection of low levels of EDC



Benefit of fast multipoint analysis: EDC



Start-up of Ametek MS



One year later

- Identify leaks
- Reduce ambient levels to well below legal pollution control board limits

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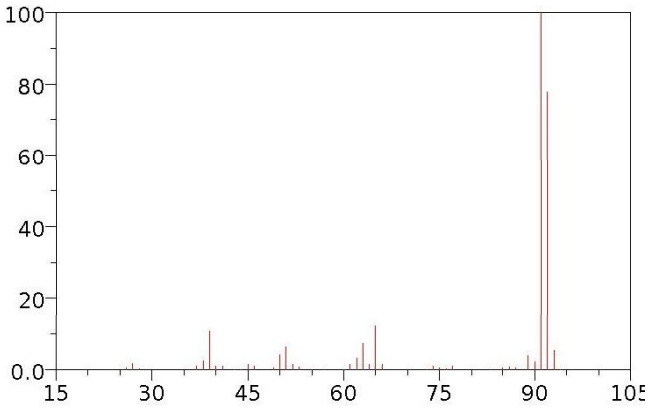
Benzene

- Typically found in Refinery & Chemical Plant ambient
- Shown to be carcinogenic
- 8 hour Maximum concentration on average is 1 ppm in air
- Short-term exposure limit 5 ppm
- Need to measure in the presence of other, less harmful, aromatics which can be present at higher levels
  - *E.g. Toluene - 8 hour maximum concentration is 100 ppm*
- *Only Mass Spectroscopy can achieve this at Multiple Sample Points because of his speed of response*

Benzene & Toluene



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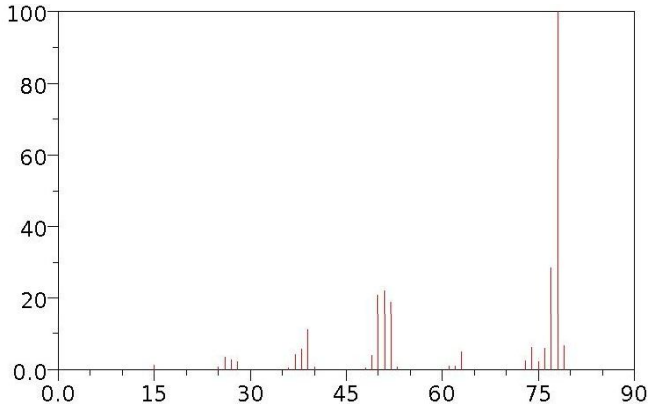

Benzene
C_6H_6
MW 78
Principle peaks 78 ($C_6H_6^+$), 77 ($C_6H_5^+$)

Summary

- High sensitivity enables trace detection well before reaching legal exposure limits
- MS allows for confident identification even in complex mixtures
- Multiple compounds monitored by one system with minimal method development and at high speed
- Additional VOCs can be detected with no additional hardware
- Membrane inlet (MIMS) is the method of choice for this application

Summary

Thank you very much for your attention

Please ask your questions