Using Impedance Dew Point Transmitters to confirm quantities of Moisture in Medical Gases

Application Background

It is vitally important that compressed air and gases, used in medical applications for patient care, are clean and nearly sterile. Specifications have been introduced for monitoring the concentration of key contaminants in these gases which, if left uncontrolled, could be harmful to patient health. These contaminants include amongst others carbon monoxide and dioxide, oxides of nitrogen, oil and water vapour.

In the case of water vapour, there are two key concerns. First is the potential for condensation to occur in the gas systems, which could both result in liquid water interfering with critical apparatus and also the potential for such condensation to result in corrosion within parts of the gas system. Secondly there is the potential that excess water vapour concentration will help to promote the growth of harmful bacteria, which often only flourish in higher humidity conditions and could be harmful to the patients receiving the medical gases.

Legislation

The 2002 European Pharmacopoeia, published by the European Department for the Quality of Medicines in Strasbourg, contains a monograph describing the method recommended for the determination of moisture content of medical gases. The recommended maximum allowable moisture concentration is 67 parts per million by volume. (-45 °C dew point).

In the UK the correct use and control of medical gases is regulated by the Health Technical Memorandum. This document has recently been updated to HTM02 and includes the recommendation that "All medical gas supplies should be continuously monitored for dew point or moisture content".

For the first time HTM regulations give specific information on the specification and measurement of dew point or moisture content. The relevant section states:

15.146 "The plant test point and a representative sample of terminal units distributed throughout the pipeline systems should be tested for total water content. The water content must not exceed 67 ppm(v) (equivalent to an atmospheric pressure dew point of approximately –46 °C). The typical water content of medical gas cylinders is normally below 5 ppm(v). Water vapour content may be measured using the appropriate test device described in Appendix E (see also paragraph 15.117)."

Whilst paragraph 15.117 tells us:

15.117 "An electronic dew-point meter should be used in preference to water content measurements".

More details are given in paragraph 7.41:

7.41 "The dryer control system should ensure that regeneration is operated in proportion to the compressed air usage. The effectiveness of the control system will become apparent when the efficiency of the compressor system is tested at 10% and 0% of the system design flow. Evidence of the reliability and performance of a dryer system should be sought from manufacturers, since these items are critical to the overall performance of the compressor system. The dryer control system should include a dew-point hygrometer and display with a minimum accuracy of ±3 °C in a range from –20°C to –60°C atmospheric dew point, with an alarm set point of –46 °C. (Note that this supersedes the HTM 2022 requirement for an alarm trigger point of -40 °C). It should be arranged that in the event of open circuit, a "plant emergency" alarm be initiated."

Measurement Technique

Michell Instruments is able to provide solutions for both portable and fixed point measurements.

The latest portable offered by Michell is the MDM300. This instrument utilises an advanced ceramic sensor technology to provide rapid spot check measurements. The MDM300 can provide measurement in both dew point and moisture content with 67ppm(v) achievable in less than 10 minutes. Combine this with wireless communications, data logging and a full range of accessories and you have the perfect instrument for any medical gas application.

Easidew On-line

For permanent monitoring Michell Instruments can supply the Easidew on-line, for dew-point or moisture content (ppm). This instrument utilises the ceramic sensor and can provide a digital display and analogue output for connection to a central data collection system. When combined with the Easidew Sampler these instruments provide a complete system, which is easily installed to provide continuous monitoring.

MDM300 portable dew-point hygrometer

Users

Aberdeen Royal Hospital
Ashford Hospital
ADC Gas Analysis Limited
Al-Essa Medical & Scientific
ALTEC
Armstrong Medical
Bedfont Scientific (Medical Equipment Supplies)
Belfast City Hospital Trust
City Hospital NHS Trust - Birmingham
Colchester General Hospital
D & L Medical
Dolby Medical Home
Edith Cavell Hospital - Peterborough Hospital NHS Trust
Glanrhyd Hospital
Grampian University Hospital
Hammersmith Hospital
Hollingsworth Design Ltd
Ipswich Hospital NHS Trust
Johnson & Johnson Medical Ltd
K&H Medical Ltd
M&M Medical Ltd
MEC Medical Ltd
Medaes
Medical Gas Testing Services - Hertfordshire
MGPS Training - Bristol
Midland Medical Services Ltd
Norfolk and Norwich Hospital
North Bristol NHS Trust
Northampton General Hospital
Nottingham City Hospital
Portsmouth Hospitals Trust
Princess of Wales Hospital
Purely Med Gas Inc.
Queens Hospital
Royal Shrewsbury Hospital
SHJ Hospital Pipeline
Southend Hospital NHS Trust
St James University Hospital
St Peter's Hospital
St. Georges Hospital
The Queen Elizabeth Hospital
University Hospital of North Staffs
University College Hospital
West Suffolk Hospital
West Wales General Hospital
Wrexham Maelor Hospital

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