GAS ANALYSIS REQUIREMENTS IN THE PVC MANUFACTURING PROCESS

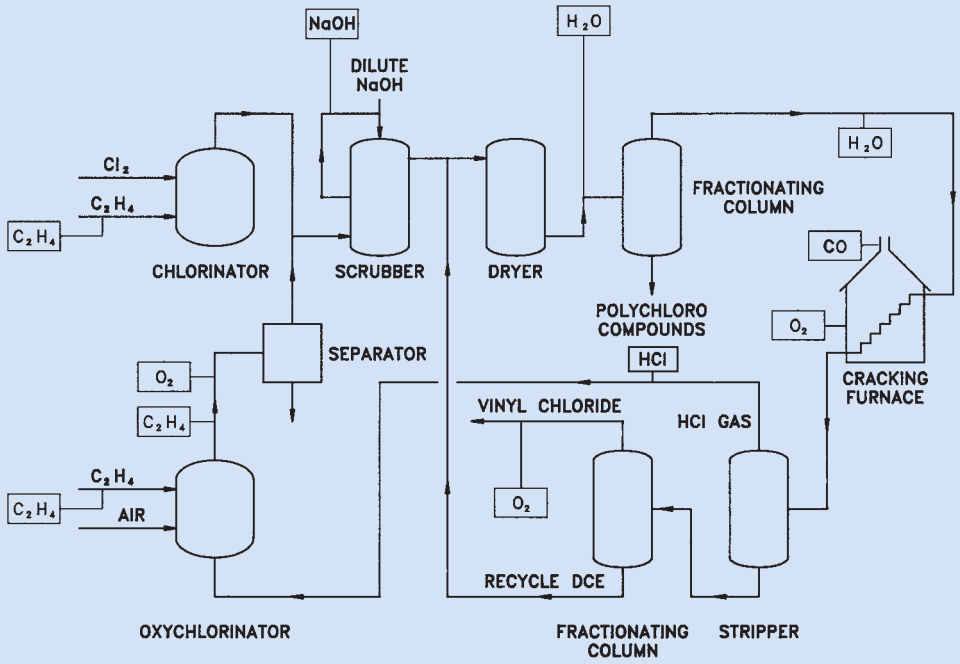

Figure 1

The synthesis of polyvinyl chloride (PVC) involves numerous stages, all of which require the accurate analysis of either the feedstock or intermediates to maintain product quality, control the efficiency of the plant and ensure that the integrity of the plant is not compromised.

Servomex has installed worldwide many infrared and paramagnetic analysers and systems designed to monitor corrosive gases and liquids in demanding process environments as typified by those found on vinyl chloride monomer (VCM) and PVC plants.

EDC/VCM manufacture

VCM is the main feedstock used in the manufacture of PVC, a raw material for a wide range of plastic products.

In a typical process (Figure 1), ethylene is first chlorinated over a catalyst to produce ethylene dichloride (EDC). At this stage, it is necessary to measure ethylene concentration since it is the controlling ingredient in the chlorination process. For safety reasons, oxygen also needs to be monitored before the chlorination step to raise an alarm if explosive conditions are approached.

The crude EDC formed is scrubbed with caustic soda to remove hydrogen chloride and dried before storage. The drying process is essential since traces of moisture in EDC are extremely corrosive towards many materials. The trace moisture levels in EDC need to be accurately monitored after the drying process and during storage.

In the next stage of manufacture, the EDC is cracked in a furnace to produce HCl and VCM. Oxygen concentration is measured on the VCM or recycled HCl line to ensure product quality and for safety.

Ethylene analysis

Ethylene concentration in the chlorination process is measured using a Servomex Xendos 2500 infrared analyser with a typical range of 0-50%. The gas presented for analysis is very corrosive and can contain appreciable levels of HCl, chlorinated hydrocarbons and water. Hastelloy or Monel is usually specified for the measurement cell with PTFE pipe work in the sample conditioning system.

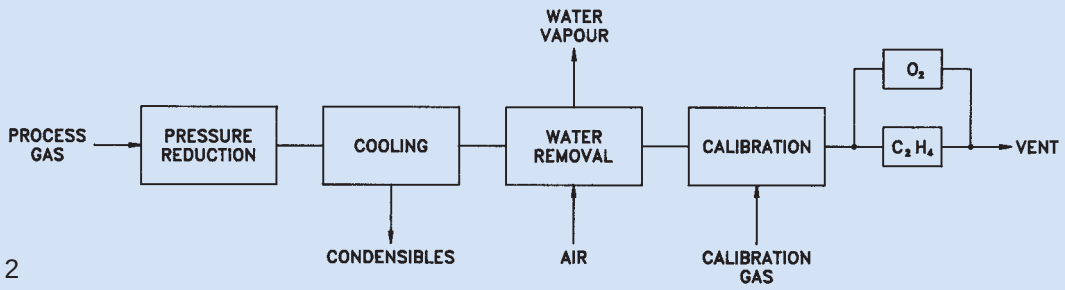

Figure 2

The pressure and temperature of the process at the measurement point is usually above ambient and the gas needs to be cooled before analysis allowing any vapours to condense and be removed (see Figure 2). By drying the process gas, further corrosion can be reduced.

Oxygen analysis

The Servomex 1100A paramagnetic analyser is used to measure the oxygen, typically in the range of 0-10%. For safety reasons, it is often necessary to install multiple analysers reporting to a voting system, prior to the chlorination stage, to ensure the plant is fully protected in the event of analyser failure.

The 1100H model can accept process gases up to 105°C without removal of condensible vapours thus making it suitable to measure oxygen in the process stream prior to chlorination. The sample at this part of the process contains high levels of HCl (about 30%) and water (with a dew point of about 80°C). To prevent condensation, the sample line is maintained at 95-105°C, preventing corrosion and enabling a true reading of oxygen concentration to be obtained.

The 1100A analyser is suitable for process gases with a dew point temperature of 10°C below ambient temperature. It can be used for measurements in the VCM gas line where the sample has a low HCl level and dew point.

Moisture measurement in EDC

The Servomex Xendos 2500 infrared analyser can be configured for trace moisture measurements by installing special ultra-narrow bandpass measurement and reference infrared filters, and a liquid sampling cell. Typically, measurement ranges down to 0-50ppm H_2O in EDC are achieved using quartz windows. The instrument may be calibrated using the automated Karl-Fischer titration method, a standard laboratory technique for trace water determination.

A special requirement in trace moisture measurement is the use of automatic sample temperature compensation. Without compensation, the cell temperature must be maintained within ±0.5°C as sample temperature fluctuations will produce errors in the measurements.

Servomex analysers

The Servomex Xendos 2500 infrared analyser employs a single beam, dual wavelength measurement technique which gives increased measurement sensitivity and a high degree of stability. This technique is virtually unaffected by contamination on the sample cell windows. Maintenance requirements are low and the cells can be easily changed or cleaned. The analyser has a rugged construction and is certified for use in the hazardous areas found in VCM processes.

Servomex 1100 series oxygen analysers employ the well-proven paramagnetic transducer which gives an accurate and fast response. Since this is a physical measurement technique, there are no chemicals or electrolyte to replace and maintenance requirements are low. The transducer unit is certified for use in Zone 1 and 2 areas and the control unit can be used in a Zone 2 area without the need for purging.

Other Servomex applications on VCM plant include the measurement of NaOH concentration in scrubbers, HCl concentration in the recycle line, O_2 in the cracker flue gas (to optimise combustion efficiency), and CO in the flue gas (for pollution control).

Certificate No._____Q5166
BS EN ISO 9001

Servomex
LEADERS IN GAS ANALYSIS

Servomex Group Limited, Jarvis Brook, Crowborough, East Sussex, TN6 3DU, England ☎ (44) 1892 652181. Fax: (44) 1892 662253
Servomex International Limited, Jarvis Brook, Crowborough, East Sussex, TN6 3DU, England ☎ (44) 1892 652181. Fax: (44) 1892 662253
Servomex, Niederlassung Deutschland, Münsterstraße 5, 59065 Hamm, Germany ☎ (49) 23 81 68 82 13. Fax: (49) 23 81 68 81 75
Servomex Company, Inc., 90 Kerry Place, Norwood, MA 02062, USA ☎ (1) 617-769-7710. Fax: (1) 617-769-2834
Servomex S.A.R.L., 8 Rue Proudhon, B.P. 50, 93212 La Plaine St Denis, France ☎ (33) 1-48.20.83.22. Fax: (33) 1-48.20.63.58
Servomex B.V., PO Box 406, 2700 AK Zoetermeer, Stephensonstraat 20, 2723 RN Zoetermeer, Netherlands ☎ (31) 79-341 71 41. Fax: (31) 79-342 08 19
Servomex Asia/Pacific Ltd, 5F-4, No. 328 Chang Chun Road, Taipei, Taiwan, R.O.C. ☎ (886) 2-718 0031. Fax: (886) 2-712 0653
CNTIC-Servomex Technical Service Centre, No.2 Sheng Gu Zhuang, Chaoyang Area Beijing, China, PO Box 9821, Beijing, Post Code 100029 ☎ (86) 1-426-9911, 2101. Fax: (86) 1-426-8694

7986 - 2187 02/96