

of the operation, it is removed to levels of below 100ppm (typically to 10ppm) in the treatment plant. An analyser measuring in the range of 0-1000ppm is used to monitor the outlet stream and show the performance of the treatment plant. The treatment plant can also be used to remove hydrogen sulphide traces from heavier feedstocks.

- ③ After every 20 days or so of operation, the cracking furnaces need to be decoked since they acquire a coating of carbon over time and lose efficiency. This is done by burning off the coke with air in a steam atmosphere. The progress of the decoking phase is monitored by measuring the amount of carbon dioxide (0-5%) in the effluent. It rises as the carbon is burnt off and then reduces to zero when the furnaces are clean again, and the plant can be returned to normal operation.
- ④ After quenching the cracked gas, residual carbon dioxide is removed by a caustic tower and any final traces monitored by the cracked gas analysers ④. By comparing analyser readings after the ethane treatment plant ② and before the scrubbing tower ④, the most economical operation can be obtained. The cracked gas analysers can also be used in monitoring for furnace upsets. In some plants, both low level CO₂ and CO are analysed.
- ⑤&⑥ The ethylene fractionator is a distillation column in which the overhead product is ethylene and the bottoms are ethane. In principle, if the temperature on the tower is controlled and the temperature gradient known, the composition of the gas along the column is known. In practice it is difficult to compensate for any small pressure changes in a temperature control system. The two analysers, measuring ethane in ethylene and ethylene in ethane, are used to monitor the composition at two key points to help in the operation of the column.
- ⑦ The ethylene product at the end of the process is monitored for residual CO₂ traces to check purity.
- ⑧ The sodium hydroxide solution feed to the CO₂ scrubbing tower is monitored for correct concentration.

Infrared analysers

Servomex 2500 infrared process analysers employ a single beam, dual wavelength measurement technique which offers high performance, repeatability and long-term stability. In particular, measurement is virtually unaffected by build-up of sample cell contamination since it influences both wavelengths equally. A 50% loss of signal due to obscuration of the sample cell windows produces no more than 3% fsd error in the reading.

In addition, Servomex has developed a gas filter correlation (GFC) infrared analyser, the 2510, which can measure trace levels of carbon dioxide or carbon monoxide with exceptionally low cross-interferences from other hydrocarbons or flue gases. The GFC technology uses hermetically-sealed gas cells containing reference and inert gases in place of the usual interference filters, giving the benefits of extended sensitivity and excellent stability.

The 2510 is available with a minimum measurement range of 0-50 vpm (0-90 mg/m³) CO₂ in mixed light hydrocarbons and its wide dynamic range enables it to measure higher concentrations as well as trace levels. An interference rejection target of equal or greater than 100,000:1 has been achieved for ethane, ethylene and propane, and interferences from other hydrocarbon components have been reduced to acceptable levels.

Servomex' analysers have been designed for modern process environments with emphasis on rugged construction, reliable performance and easy servicing. Full certification is available for use in hazardous areas. The analyser's control panel contains a bright vacuum fluorescent display for clear visibility and very simple control panel. The system is menu-driven and designed to be as intuitive as possible, requiring the minimum of operator familiarisation.

Sample conditioning

The gas sample presented to the analyser should be clean and dry. In a typical sample conditioning system, the pressure and flow of gas is first controlled to suitable levels for the analyser, and filtered to remove any particulate matter. However, some streams on ethylene plants (particularly the cracked gas if sampled before the quenching system, and the decoking steam mixture) do require special sample conditioning before they can be analysed. This would typically involve sampling components to remove condensibles and heavy hydrocarbon contaminants which would otherwise accumulate and block the analyser sample lines.

Other measurements

Other important process measurements on ethylene plants include the monitoring of the oxygen in cracking furnace combustion gases for efficient combustion control, and the monitoring of these flue gases for pollutants such as carbon monoxide to comply with emission regulations. These are indicated at points 9 and 10 on Figure 1. Further information on the use of the model 2700 zirconia oxygen analysers and the 2510 carbon monoxide analyser for these applications is available from Servomex.

