Hydrocarbons (THC, CH_4 and NMHC)

Field of Application

Continuous ambient air monitoring analyzers used to measure total hydrocarbons (THC), methane (CH_4) and non-methane hydrocarbons (NMHC) must meet the following performance specifications, unless an equivalent, alternative analyzer is authorized in writing by the Director. It is not the intent of the Department to exclude analyzers with operating principles and/or equivalent performance specifications different than those provided. Written authorization from the regulator must be received prior to the purchase, installation and/or use of any analyzer based on an alternative principle of operation or differing performance specifications from those herein.

THC refers to a broad family of chemicals containing carbon and hydrogen atoms. CH_4, a non-reactive hydrocarbon, is the most common hydrocarbon in the atmosphere. THC excluding CH_4 are referred to as NMHC. Specific reactive hydrocarbons or NMHC can react with oxides of nitrogen in the presence of sunlight to form ozone. Health effects may result at varying concentrations depending on the specific hydrocarbon.

Air Quality Objectives

Alberta Ambient Air Quality Objectives (AAQOs) do not exist for THC, CH_4 or NMHC at this time, but AAQOs do exist for specific hydrocarbons such as benzene. All applicable substance specific AAQOs must be used when measuring any specific hydrocarbon.

Principles of Operation

Continuous ambient air monitoring methods accepted by the Department for measuring ambient hydrocarbons (THC, CH_4 and NMHC) include the following.

Flame Ionization Detector (FID): Hydrocarbons are measured by delivering the sample gas to a detector flame. During the combustion, hydrocarbon-based gases are ionized creating a current flow which is proportional to the amount of hydrocarbons in the sample. For a THC measurement, the entire sample is sent to the FID detector. The FID detector can be augmented to identify CH_4 or NMHC using one of the methods described below.

Gas Chromatography (GC)/FID: To measure CH_4, sample air is injected into a gas chromatography (GC) separation column first. Methane has a low molecular weight and is highly volatile and will exit the column at a higher velocity. From the GC column, the methane passes through to a detector oven and can be measured by the flame ionization detector. For the backflush version of this monitor, the GC column flow is then reversed, 'backflushing" the column. This flow is sent to the FID for a non-methane measurement. THC is calculated by the sum of the CH_4 and NMHC measurements.

Oxidizer/FID: This method makes a THC measurement by sending the entire sample to the FID. It then sends the sample through an oxidizer, which destroys the heavy hydrocarbons, leaving only CH_4. This sample is passed to the FID for the CH_4 measurement. NMHC are determined by subtracting the methane concentration from the THC concentration.

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Performance Specifications

Specifications listed here are minimum performance specifications. Some applications may warrant use of equipment with better specifications.

Criteria	Performance Specification
Required Operating Range (Full Scale):	10 ppm, 20 ppm, or 50 ppm
Zero Noise:	1% of full scale
Lower Detection Limit:	60 ppb
Zero Drift (24-hr):	1% of full scale
Span Drift (24-hr):	1% of full scale
Linearity:	1% of full scale
Precision:	1% of full scale
Rise time:	Maximum 70 seconds
Fall time:	Maximum 70 seconds

ppm is parts per million by volume
ppb is parts per billion by volume

Operational Requirements

Installation and operation of THC, CH_4 and NMHC analyzers must meet all requirements specified in the Air Monitoring Directive (AMD).

All analyzers must be operated according to manufacturer's specifications.

Calibration Requirements

Refer to the manufacturer's requirements for calibration and the calibration section of the AMD.

Reporting Requirements

Refer to the reporting section of the AMD.

Additional Information

For the backflush GC/FID method, the chromatographic separation is a critical issue in ensuring accurate CH_4 and NMHC separation. The GC column must be maintained according to manufacturer's specifications.

For the oxidizer method, any hydrocarbon compound not destroyed will be measured as CH_4. Interferences may be caused by any hydrocarbon that is unaffected by the oxidation (e.g., chlorofluorocarbons). An advantage is that no GC column is required so no carrier gas or GC maintenance is necessary to run the system.