GAS CHROMATOGRAPH MAINTENANCE

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Introduction

On line Btu gas chromatographs have become a vital part of the overall measurement of natural gas in today's market. The gas chromatograph is used to help calculate the energy value of a gas sample for use in the custody transfer application. As a vital cog in the overall application the chromatograph must be maintained in systematic way to avoid downtime. It must also have a capability of alerting the technician of impending or occurring problems for quick action.

Installation considerations to prevent maintenance problems

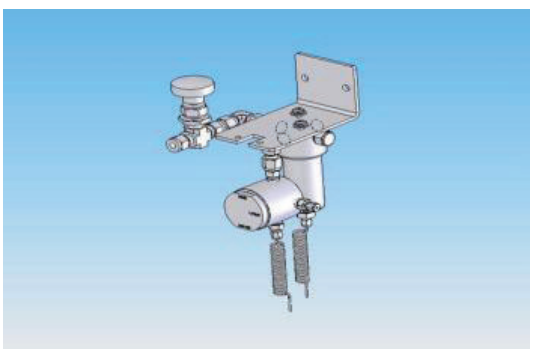
A maintenance regime for a gas chromatograph starts with a solid installation and start up. The power and grounding requirements must be adhered to in order to prevent problems such as unanticipated cold starts. The sample conditioning system is vital to the ongoing health of any gas chromatograph. The conditioning system is there to provide a clean, dry representative sample of gas to the chromatograph for analysis. The components of the sample conditioning system include sample tubing, filtration elements and liquid capture membrane components. The maintenance and inspection of the sample system components depends greatly on the gas sample being analyzed. Samples that contain liquids can present a potential problem to the conditioning system if they overwhelm the membrane components that are intended to capture and hold the liquids from getting into the chromatograph. The correct sample pressure to the gas chromatograph is set at the probe regulator.

Figure 1: Typical probe regulator in pipeline

The primary purpose of the probe regulator is to extract a representative sample of gas from the pipeline, reduce the pressure to a pressure suitable for use by the gas chromatograph and insert the

sample into the transport tubing moving it to the gas chromatograph.

The sample tubing from the probe to the chromatograph must be stainless steel and heat traced if lower temperatures can be encountered. The heat trace should be checked to insure that it is operating correctly and keeping the tubing at the desired temperature. Once the gas has been transported to the chromatograph it should be further conditioned by a sample system that prevents liquids and particulates from entering the chromatograph itself. These systems can have varying degrees of conditioning and liquid protection depending on the quality of the gas sample coming from the pipeline. The whole intent is to insure that the chromatograph is given a



clean, dry sample of gas to analyze.

Figure 2: Sample conditioning module

These sample conditioning elements will need a varying degree of maintenance and inspection depending on the quality of the gas in the pipeline and the location of the chromatograph in the system. If the chromatograph is located near production activity it will need more intensive inspection activity than a location downstream of processing plants and near distribution delivery points.

Gas Chromatograph Enclosures

In conjunction with the sample conditioning, it may also be necessary to keep the chromatograph and its accessories at a higher temperature to protect from liquids forming in the gas sample. Small or even walk-in sized enclosures can be used to protect the chromatograph and particularly the calibration standard from lower ambient temperatures that may be below the hydrocarbon dew point of the gas sample.

An example of a pipeline mountable enclosure is shown in figure 3 that provides for an environment for the chromatograph and the associated calibration standard that is well above the dew point of the gas.

Figure 3: Environmental enclosure

The enclosure typically will have an internal heater, AC or catalytic, which keeps the environment at the elevated temperature needed to protect the gas sample and the calibration gas.

Chromatogram for Troubleshooting

One of the most valuable aids for determining the overall health of a chromatograph is the chromatogram. A chromatogram is a graphical depiction of the component peaks relative to a baseline. The chromatogram shows the various components on a retention timeline that identifies the component in the gas sample. With modern gas chromatograph, certain components are used to set the overall retention timing for all the components of a gas sample. In the chromatogram in figure 4, the component NC5 is used as the primary peak to set the retention timing for identifying the other components in the sample. If the timing of that peak is not within the correct window the other components may not be identified correctly or at all. The modern gas chromatograph provides the technician the tools through the software to correct the placement of these control peaks along the retention timeline and bring all the components back into correct analysis. The software also allows for relabeling peaks which have been misidentified along with setting the correct timing gates, if necessary. The chromatogram in Figure 4 shows the component peaks along the analysis retention time line. The order of these components is set by the separation column composition.

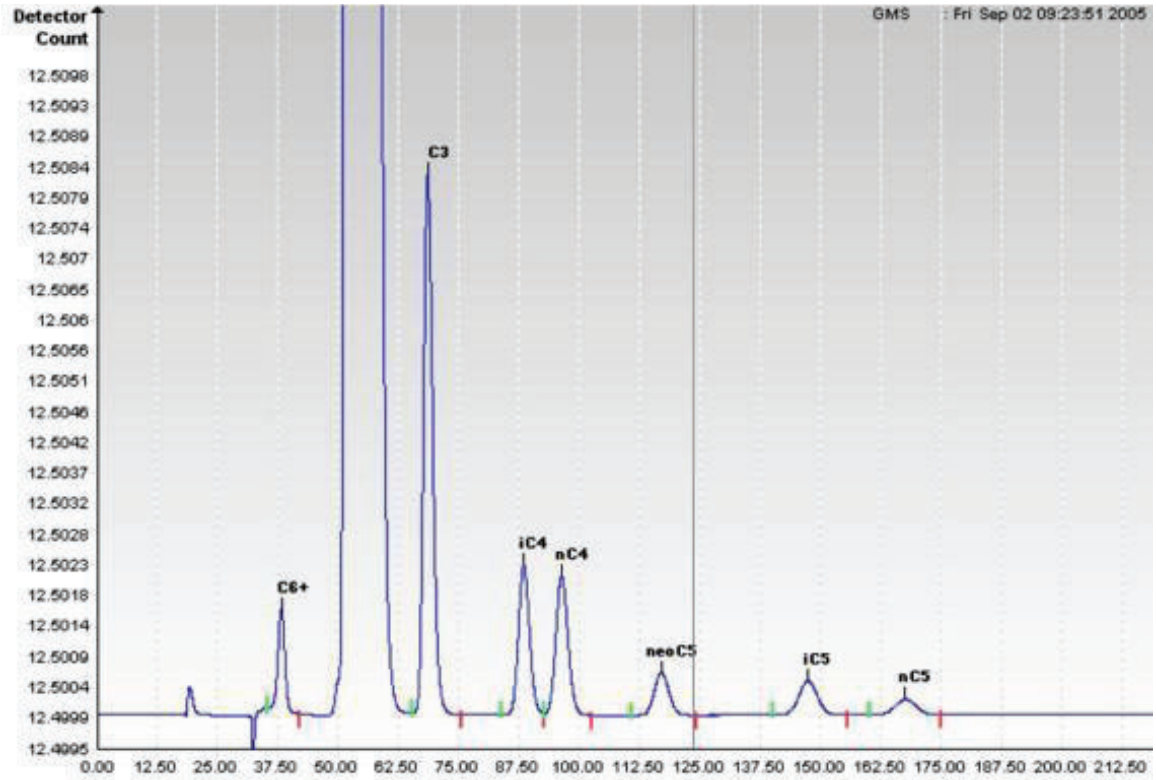


Figure 4: Chromatogram

The software also allows for using chromatograms developed earlier by the unit and compares it with a current chromatogram. This process provides a clear indication of changes to the peak structures and timing from one chromatogram to the other.

Modular Maintenance Concept

In view of the time constraints on many field technicians in the current industry situation, some modern gas chromatographs are offering a different approach to handling hardware maintenance. The modular construction of the modern digital chromatograph, shown in figure 5 and 6, has greatly reduced the time and expertise needed to repair or upgrade chromatograph hardware. When a catastrophic problem has occurrred to a chromatograph, such as a slug of liquid getting into the chromatograph, a change of the internal module can get the unit up and running in short order. These modules are generally kept on the manufacturers' shelves for quick delivery. The installation of the new modules takes a minimum of time and effort. Once installed reprogramming the module with the chromatograph configuration is a very simple process through the interface software. Detecting which module may be defective is an easy procedure using the alarm system of the unit, checking the chromatogram or using other troubleshooting activities through the software. Modular components provide for rapid repair or replacement of problem components and can get the chromatograph operational much quicker.

Figure 5-Chromatograph Modular Components

Figure 6-Internal chromatograph module

Summary

The modern digital gas chromatograph is far from a maintenance free instrument. But with correct installation procedures, active monitoring and sample conditioning they can operate in the field environment for many years with no trouble. Providing clean, dry gas and stable power to the chromatograph will help insure stable operation.