Consumer and Corporate Affairs Canada
Consommation et Corporations Canada

Legal Metrology
Métrologie Légale

SPG - 268
Approval No. d'approbation

Ottawa 1981-11-26

APPROBATION SPÉCIALE

SPECIAL APPROVAL

Accordee a:

Granted to:

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SPECIAL APPROVAL 268

Subject: Use of Chromatographic Systems for Determination of Heating Value and Relative Density of Natural Gas

Special Approval has been granted by the Legal Metrology Branch to Nova, An Alberta Corporation, for the operation of chromatographic systems at their Calgary and Edmonton Laboratories.

A. Chromatographic Systems Located At Edmonton, Alberta

INSTRUMENTS:

1. HEWLETT PACKARD (H.P.) ISOTHERMAL 5710A GAS CHROMATOGRAPH:

Analyzes for mole fraction of Nitrogen, Carbon Dioxide, Methane, Ethane, Propane, Isobutane, N-Butane, Isopentane, N-Pentane and Hexanes plus.

Chromatograph Conditions

1.1 COLUMNS:

i) 1/8" (3.175 mm) by 7 foot (2.1336 meters) stainless steel. 30% DC 200/500 silicone oil on Chromosorb P, AW, 80/100 mesh.

ii) 1/8" (3.175 mm) by 25 foot (7.6200 meters) stainless steel. 30% DC 200/500 silicone oil on Chromosorb P, AW, 80/100 mesh.

1.2 TEMPERATURE:

i) Column: 92°C

ii) Detector: 200°C

1.3 CARRIER GAS:

Helium: flowrate of 59 cc/min.

1.4 SAMPLE LOOP VOLUME:

1/4 cc (cubic centimeter)

1.5 THERMAL CONDUCTIVITY DETECTOR (TCD):

Current: 243 milliamps.

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. TEMPERATURE PROGRAMMABLE 3700 VARIAN GAS CHROMATOGRAPH:

nalyzes for mole fraction of Helium, Oxygen and Nitrogen.

hromatograph Conditions

.1 COLUMNS:

i) 1/8" (3.175 mm) by 10 foot (3.0480 m) stainless steel. hromosorb 106, 80/100 mesh.

ii) 1/8" (3.175 mm) by 25 foot (6.0960 m) stainless steel. olecular sieves 45/60 mesh.

.2 TEMPERATURES:

i) Column: 80°C

ii) Detector: 100°C

.3 CARRIER GAS:

Argon: flowrate 11.5 cc/min.

.4 SAMPLE LOOP:

1/2 cc (cubic centimeter)

.5 THERMAL CONDUCTIVITY DETECTOR (TCD):

Current: 132 milliamps.

PERIPHERAL EQUIPMENT:

.1 Two 18652A Hewlett Packard A/D Converters:

To convert an analog signal from the two Chromatographs to a gital signal for the computer.

.2 One 18653B Hewlett Packard Sample/Event Control Module:

Used to operate the valve switching on both of the Chromato- aphs.

.3 One 7123A Hewlett Packard Recorder:

Provides a Chromatograph from the Chromatographs.

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B. Chromatogrphic System Located At Calgary, Alberta

1. H.P. 5730A Gas Chromatograph

The analysis for mole fraction of nitrogen, carbon dioxide and hydrocarbons (methane to hexanes) are generated by H.P. 3353 Lab Automation System.

Chromatograph Conditions

1.1 1/8" x 6' Porapak Q column, 80/100 mesh.

1.2 1/8" x 5' 30% DC 200 column, 80/100 mesh.

1.3 Oven temperature: 85°C.

1.4 Carrier gas is helium Ultra High Purity (U.H.P.) @ flow of 25 cc/min.

1.5 T.C.D. at a temperature of 100°C and a current of 250 mA (sensitivity at 6).

1.6 Valve temperature (auxiliary): 100°C.

1.7 A 10 port valve is used in conjunction with a 6 port valve utilizing a 1/4 cc sample loop.

2. Varian 3700 Gas Chromatograph

The analysis for mole fraction of helium is generated by H.P. 3353 Lab Automation System.

Chromatograph Conditions

2.1 1/4' x 6' Porapak Q column, 80/100 mesh.

2.2 1/8" x 20' molecular sieve column, 45/100 mesh.

2.3 Oven temperature 60°C

2.4 Carrier gas is nitrogen @ flow of 30 cc/minute.

2.5 T.C.D. at a temperature of 170°C, a filament temperature of 200°C and a current of 89 mA.

2.6 Injector temperature of 79°C.

3. Peripheral Equipment

3.1 Two 18652A Hewlett Packard A/D Converters: To convert an analog signal from the two chromatographs to a digital singal for the computer.

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Peripheral Equipment (Cont'd)

3.2 One 18653B Hewlett Packard Sampler/Event Control Module: Used to operate the valve switching on both of the chromatographs.

3.3 One 385 Linear Recorder: Provides a chromatogram from the chromatographs.

3.4 One 3353A Hewlett Packard Lab Automation System: Used to store programs and methods for operation of the chromatographs and Peripheral Equipment.

3.5 One 9871A Printer: Printing of gas analysis reports.

3.6 One 2645A Hewlett Packard CRT Terminal with 2 mini-cassette tapes: Serves as a communication link between the operator and the other equipment.

Mini-cassette tapes are used to store raw analysis data from the chromatographs.

Notes:

(i) The expected range of heating values and relative density values of samples to be analysed by the above systems is 890 to 1240 BTU, and 0.565 to 0.730, respectively.

(ii) Heating values determined in terms of British Thermal Units are those referenced to the BTU's evolved by the complete combustion at constant pressure of one standard cubic foot of gas with air, both saturated with water vapour, the products of combustion being at 60°F, and the water formed by the combustion reaction being condensed to the liquid state.

The standard conditions refer to 60°F and 30 inches of mercury, at 32°F, absolute pressure.

(iii) The relative density value determined is to be relative to air = 1, under standard conditions of 60°F and 30 inches of mercury absolute pressure at 32°F.

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C. Sampling, Calibration, Verification, Sample Interchange

1. Sampling and Calculations

1.1 The method of sampling at each sampling station shall conform to that outlined in the AGA Gas Measurement Manual, 1963 edition or later. The samples shall be properly identified and indicate sample location, sampling date and sample pressure.

1.2 In a case where discrepancies in results between the Utility and Legal Metrology Branch cannot be resolved, the District Inspector has the right to examine the sampling procedure at the metering station involved.

2. Calibration Requirements

2.1 Since response factors for components vary with concentration, it is suggested that the Utility retain two cylinders of standard reference gas for calibration purposes. The standard gases should reflect, as closely as possible, the range of component concentrations which can be expected from pipeline sampling stations (i.e. one for high BTU and R.D., and one for low BTU and R.D.).

The appropriate response factors would be used in calculations for samples of high or low BTU gas.

2.2 The utility should perform recalibration tests, using the standard reference gases, at least once each week. This is important since response factors tend to change with time due to changing column conditions.

3. Initial Verification

3.1 The District Offices concerned shall verify the system using the standard reference gas supplied by the Legal Metrology Branch. Copies of results (i.e. data sheets, chromatograms and calculations) shall be forwarded to the Legal Metrology Branch.

3.2 Legal Metrology Branch shall provide cylinders of standard reference gas which contain, as close as possible, the range of component concentrations to be obtained from the sampling stations. These cylinders are of gas shall be certified by the Legal Metrology Branch as to component concentration (Mol %), heating value and relative density.

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4. Interchange of Samples with Legal Metrology Branch

4.1 Twice yearly, at regular six month intervals, the utility shall submit a sample of gas, which has been analysed for component composition, heating value and relative density for each of the approved chromatographic systems, to the Legal Metrology Branch via the District Office. Successive samples should be obtained from the different test stations, on a rotational basis.

All samples of gas submitted to Legal Metrology Branch shall be identified to indicate sample station location, sampling date, sample pressure and analytical system used for the analysis. The samples should have a minimum volume of one (1) cu. ft. at standard conditions.

Ref. G6635-N376

cc: Mr. L. Hewitt
Electricity & Gas - CALGARY

Mr. F.W. Nash
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